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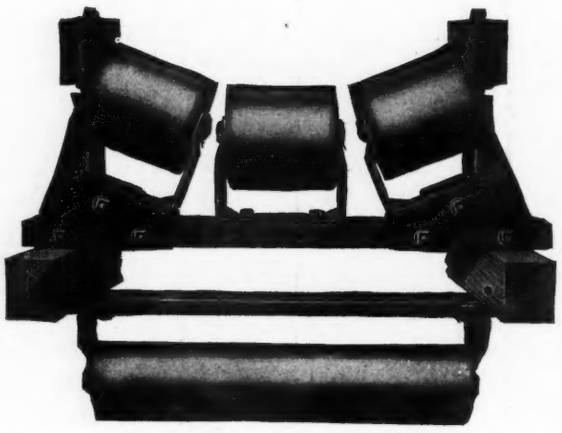

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FIG. 1. CHINESE AT WORK WASHING GOLD FROM THE RUBBLE IN THE YANGTZE RIVER

Gold Washing on the Banks of the Yangtze

By H. K. RICHARDSON*

An account of a system of gold recovery which is practiced at certain seasons of the year on the banks of the Yangtze and its tributaries. The process is essentially a crude form of placer mining, and home-made riffles are used to catch the native gold, which is afterward amalgamated with mercury and sold to the local dealers. The industry is an example of Asiatic contentment with long hours of work, small profit and slow returns, and is said to be over a thousand years old.

WHEN traveling up the Yangtze River during the low-water stage, one's attention is attracted by many mounds of pebbles seen on the banks, as soon as the boundary of Szechuen Province is passed. These mounds consist of the refuse or tailing from a crude type of placer mining which is carried on by the Chinese peasantry; and the gold which is recovered comes from the sand which underlies the pebbles. The work is performed only during five or six months of the year—from December to May, when the banks are uncovered sufficiently to make the operation practicable. A general view of one of these banks is shown in the accompanying cut. The river finds a new channel each year, and the position of the banks varies, consequently, from season to season.

*105 Clowes Terrace, Waterbury, Connecticut.

Before work is begun, a hole is dug to water level and a framework erected on one side. This is about 6 ft. wide and 10 ft. long, and is made of four wooden poles, each about 3 in. in diameter and mortised together. Narrow bamboo strips are placed across the framework. These are about $\frac{3}{4}$ in. wide and the thickness of the wood, and are accurately fitted together so that no particles of gold may fall through. Alternate strips are placed from $\frac{1}{32}$ to $\frac{1}{10}$ in. below the others, so that the surface resembles that of a washing board. This portion of the machine is a triumph of Chinese skill and patience, because every one of the strips must be cut and planed by hand.

The framework is set up on one side of the well, the foot being held down by stakes and stones, and the upper end supported on trestles. The surface of the board inclines about 30°, and across the upper end is placed

a wooden framework supporting a sieve or basket. This sieve is made of plaited bamboo, and is about 3 ft. in diameter and 1 ft. deep. The cycle of operations is as follows:

A load of stones and sand brought from the diggings is thrown into the basket, water is scooped up and thrown over this, and the basket is then given a shaking and rotary motion. The water and the black gold-bearing sand wash through the sieve and, spread by the fender, roll down the inclined surface of the board. The heavier particles of sand, together with the gold, find lodgment in the little troughs, and the pebbles are washed away by the water. The washing is repeated three times. The contents of the basket are then dumped on the stone pile.

The fine, black, gold-bearing sand is collected from the grooves from two to four times a day, or whenever they are full, and the gold is finally recovered by means of mercury. In this phase of the process the sand is taken up, a pinch at a time, placed in the palm of

FIG. 2. THE INCLINED RIFFLE USED TO RECOVER THE GOLD FROM THE SANDS

the hand, and examined. When gold is seen, a little ball of mercury amalgam, held between the thumb and first finger of the disengaged hand, is applied to the spot, and the speck is absorbed. All the sand is gone over in this manner. The resulting amalgam is sold to the village silversmith, who distills the mercury, pays for the gold, and returns the mercury to the washers.

The stone pile shown in the background of Fig. 1 consists of the gravel and stone which have been treated. A crew consists of five men—one at the washer, three men digging and carrying, and one worker recovering the gold from the sand. Information obtained from various sources revealed the fact that the seekers make only enough out of the work to pay living expenses—less than 100 "cash" per day. At the usual rate of exchange 2500 "cash" are equivalent to $1 (gold). The recovery per crew of five men is less than 500 "cash" per day. This means that five men recover less than 20c. worth of gold during a working day of from sunrise to sunset. This is probably an outside figure. This class of workers constitutes a floating population, and can subsist on 15c. per day per crew of five.

To make the return noted, the crew probably handles at least from three to four tons of stone, so that the recovery is about 5c. worth of gold per ton. The method is practiced on many of the tributaries of the Yangtze River, and, according to tradition, is about a thousand years old. As the amount recovered each year is nearly the same, it is likely the gold is being washed down from an area near the source of the river.

Belgian Iron and Steel Output

The following data concerning Belgian iron and steel production during the years 1913 to 1917 appeared in the May 1 issue of *Iron Age*, and will be of interest in showing the effect of the war on those industries:

In 1917 only one steel plant was operating and only one furnace in blast. The pig-iron output was only 2460 metric tons of bessemer and 5530 tons of steel-making (openhearth) iron. The total output of finished steel was 23,630 tons and of finished iron 51,620 tons. The accompanying table gives the production, by years, of pig iron, finished steel, and finished iron.

IRON AND STEEL PRODUCTION OF BELGIUM
In Metric Tons

Year	Pig Iron	Finished Steel	Finished Iron
1913	2,484,690	1,409,460	304,350
1914	1,454,490	866,350	151,110
1915	68,150	94,270	38,090
1916	127,825	61,900	101,300
1917	7,990	23,630	51,620

The production of steel rails fell from 341,870 tons in 1913 to 29,470 tons in 1915 and 730 tons in 1917, and of beams from 175,210 tons in 1913 to 5490 tons in 1915 and 60 tons in 1917. The merchant-steel output is given as 518,370 tons in 1913, as 36,680 tons in 1915, and as 3950 tons in 1917.

Gold Production of Dutch East Indies

Gold is found in Sumatra, the Celebes, and in Dutch Borneo in beach deposits, alluvial deposits, Tertiary gravel beds, and also in vein deposits. In 1914, according to Consul A. E. Carleton, of Batavia, in *Commerce Reports* of May 29, concessions to the number of 58 had been granted for prospecting and subsequent working of gold and silver mines.

According to a government report, the working of the gravel beds has so far been of little importance, and the dredging companies have also met little success. The natives are employed to some extent in the washing of river sediment, and in certain parts of Sumatra they also work the Tertiary beds in a primitive way by tunnels. The larger companies confine themselves exclusively to working vein deposits.

It is understood that the greatest quantity of gold is produced in the residency of Benkulen, Sumatra. The gold-mining area extends sometimes to a length of 2½ miles, and this is specially true of the district known as Lebong, which lies about 46 miles north of the town of Benkulen. Water power can be employed nearly everywhere. Some mines in central Sumatra are being worked. The mines in the Celebes are not proving as rich as those in Sumatra. No reports are at hand as to the production of gold in Dutch Borneo.

The following table, published by the *Batavia Market Report and Prices Current* on Feb. 12, 1919, gives the total production of gold in florins (the normal exchange value of the florin is $0.402) from 1911 to 1918, inclusive:

Year	Sumatra, Florins	Celebes, Florins	Year	Sumatra, Florins	Celebes, Florins
1911	6,434,500	1,615,000	1915	4,116,000	1,135,000
1912	5,638,000	1,425,500	1916	2,933,000	1,035,000
1913	5,047,000	760,000	1917	4,242,500	830,100
1914	6,775,700	1,224,300	1918	3,726,500	842,700

The total production for the eight years, 1911 to 1918 inclusive, was 38,913,200 florins ($15,643,106) for Sumatra and 8,867,600 florins ($3,564,775) for the Celebes.

Use of Concrete in Underground Works*

Swelling ground, and the consequent crushing of shaft timbers, led to the experiment of lining a section of the shaft with reinforced concrete. This procedure reduced cost of maintenance and facilitated ore hoisting. Concrete is also used for lining underground storage bins. During the time that the shaft work was carried on it was necessary to exercise great care to prevent injury to water mains and the power cable situated within the shaft.

MINING operations of the Wallaroo & Moonta Mining and Smelting Co., Ltd., at Wallaroo, South Australia, are carried on through two vertical main shafts, Taylor's, 2980 ft., and Young's, about 2660 ft. deep, situated 1420 ft. apart on the same lode. Levels are opened at intervals of 120 ft., measured vertically. The deepest level to be opened from Taylor's shaft is at a depth of 2910 ft.; at Young's the bottom level is 2550 ft. from the surface.

The great depth of the main workings renders special provision for ventilation necessary, and an extensive improvement has been completed. In this system the currents from the surface traveling through the downcast (main) shafts are regulated by numerous doors, which insure supplies of the cooler air at the working faces, and to increase the circulating volume of air three old shafts have been deepened and equipped at the surface with electrically driven exhaust fans of large capacity. The present depths of these ventilating shafts are: Boor's, 2310 ft.; Office, 2070 ft., and Hughes', 1470 ft. Passes through the worked-out ground winzes serve as thoroughfares for the heated air from the lower workings to reach the inlets to the fan shafts.

Ores Occur in Separated Lenses

The lode course is fairly continuous for a length of about 2000 ft., but the distribution of commercial ore is erratic, the mineral occurring in lenses separated by unproductive bars. The country rock is a metamorphic, micaceous schist, and the lode material consists of altered mica schist impregnated with quartz carrying chalcopyrite, pyrite, and pyrrhotite, the ore veins varying from 4 ft. to over 20 ft. in thickness, with an average stoping width of about 9 feet.

Both the country rock and lode material swell when exposed to the atmosphere, and at the deep levels, although the ground is usually firm when first opened, within a short time it begins to expand, this movement being sufficient to crush ultimately the heaviest supporting timbers, and these have to be frequently renewed in all the more important workings.

Providing Underground Storage Offsets Hoisting Restrictions

As a consequence of the constant repairs required to the timbers lining the principal shafts, the time available for hoisting and sending material underground is restricted. Under these circumstances, to provide storage for the broken ore near the shafts, and to secure the highest practicable efficiency during hoisting operations, an extensive system of underground storage bins has been provided at both main shafts.

The relation of these bins to the shafts and the general arrangement is shown in Fig. 1. In their construction winzes, 5 ft. by 5 ft. within timbers, were sunk beginning from a point in one crosscut at such an inclination that they can be equipped at each level with discharge chutes, emptying either into the shaft hauling bin from which the skips are loaded, or into the next bin below. The original practice was to remove the timber, leaving the ground unsupported, but it was found under these conditions the sides caved so badly that it was necessary to devise a method of securing them. A number were lined with circular steel tubing, 3 ft. 6 in. in diameter, the space between the tubes and timber being tightly packed with waste rock. These tubes were rolled from ½-in. plate, reinforced with heavy angle iron, and made in two sections for convenience in handling. They gave generally satisfactory results, but later, owing to the scarcity and heavy cost of suit-

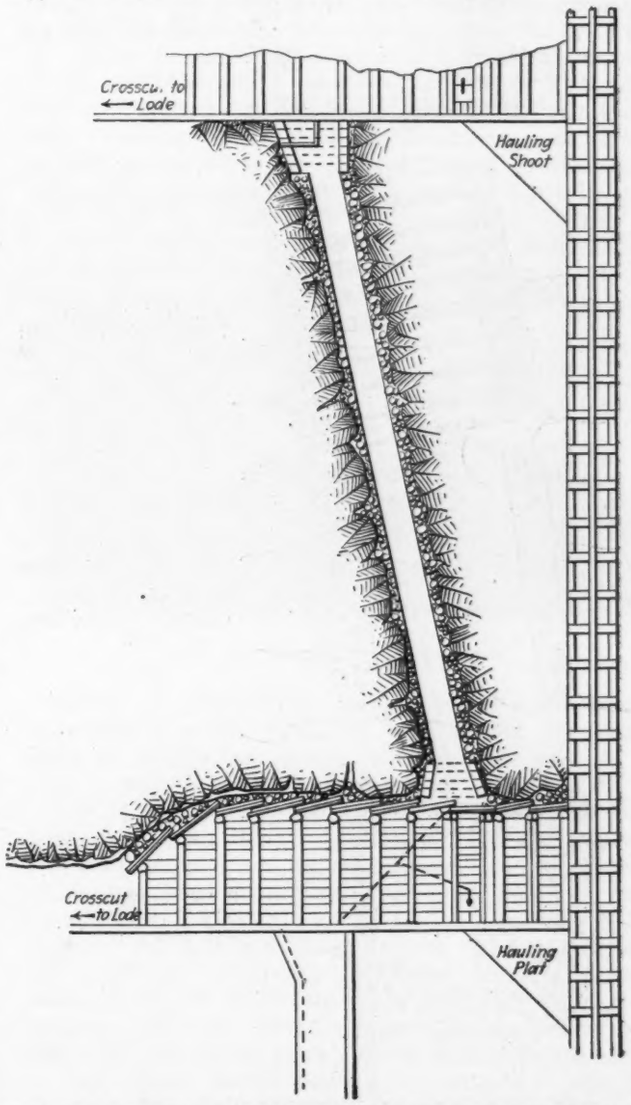


FIG. 1. GENERAL ARRANGEMENT OF UNDERGROUND ORE BINS

From *Chemical Engineering and Mining Review*, Feb. 5, 1919. Prepared by members of the staff of the Wallaroo & Moonta Mining and Smelting Co., South Australia.

able plates, the bins were lined with cement concrete, as shown in Fig. 2.

Through experiment it was ascertained that, for the concrete lining successfully to resist the abrasive action of the coarse ore tipping into an empty or partly empty bin, it was expedient to use a fairly rich mixture. The mixture was composed of one part of cement, two parts of sand, and three parts of rock crushed to pass

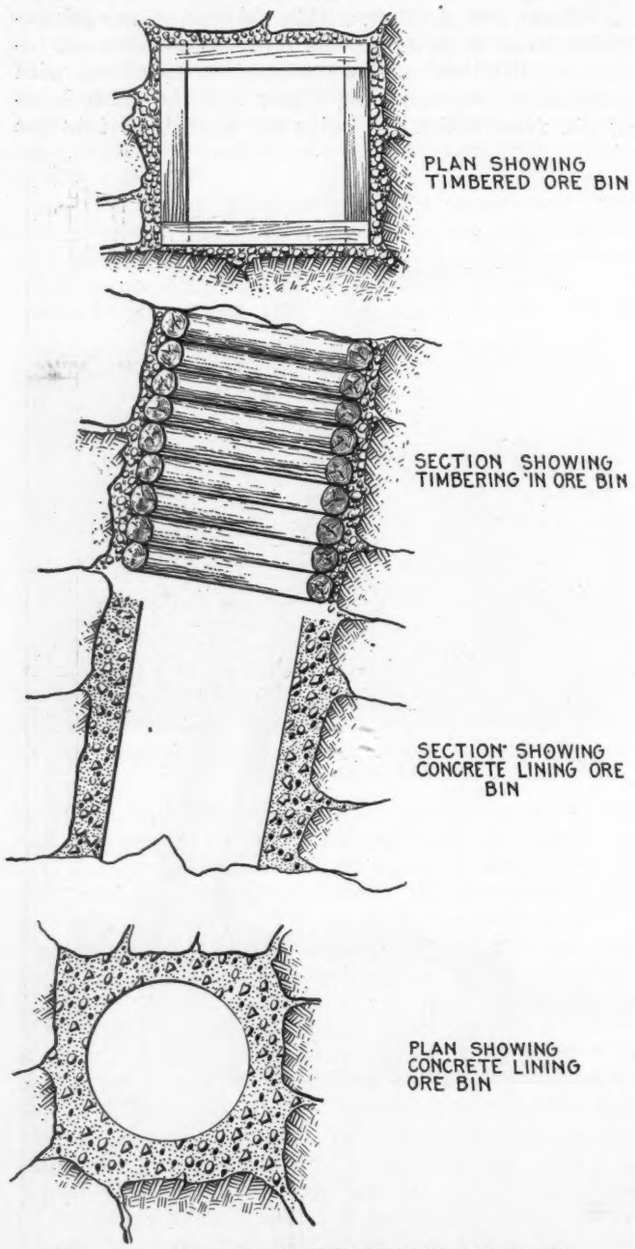

PLAN SHOWING TIMBERED ORE BIN
SECTION SHOWING TIMBERING IN ORE BIN
SECTION SHOWING CONCRETE LINING ORE BIN
PLAN SHOWING CONCRETE LINING ORE BIN

FIG. 2. LINING OF UNDERGROUND ORE BINS

a 2-in. ring, and the minimum thickness of the concrete is about 10 in. With this method the bins were made 5 ft. in diameter, the forms being constructed in three segments, as shown in Fig. 3, and the timbers used to secure the sides during sinking were removed, the concrete supporting the ground. When the forms were taken out several weeks were allowed for the lining to dry before placing the bin in use.

As already stated, the repairs due to the swelling ground are particularly heavy in connection with the main shafts, and for a considerable period after a section is constructed a large proportion of the timbers must frequently be renewed. Usually after six or seven years, however, the movement of the surrounding rock gradually decreases, although in some portions, where the ground is divided by fault planes, the swelling action is prolonged, owing to the divisions in the rock allowing air and moisture to penetrate further into the sides of the shaft. The shafts are timbered with sawed Tasmanian hardwood sets, lathed with round Australian eucalyptus, the ordinary sets being 9 in. by 9 in., whereas the principal timbers in the opening-out sets at the levels are 12 in. by 12 in. square.

The successful application of concrete to other purposes having shown its suitability for supporting excavations, at Taylor's shaft a section of the timbers about 40 ft. high was reinforced with cement concrete. This work was carried out above the 2430-ft. level, where a slide enters the shaft, making the ground so

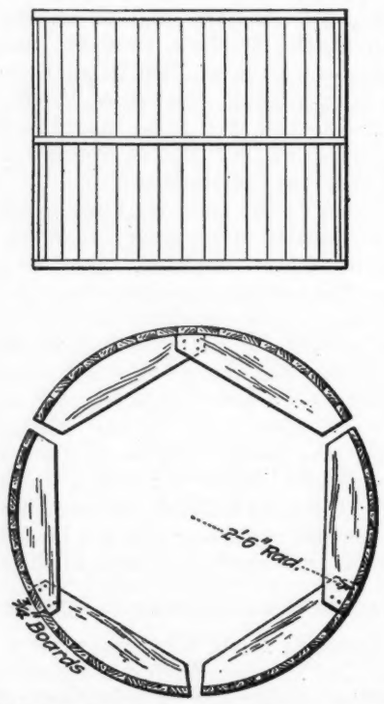


FIG. 3. FORMS USED IN CONCRETING UNDERGROUND ORE BINS

heavy that almost constant repairs to the timbers had been needed since this section was constructed, about seven years ago. As a result of the side pressure, the shaft had been forced nearly 18 in. out of alignment, which necessitated removing the old timbers as well as sufficient ground behind the sets to give room for the concrete and to allow for the straightening of the shaft.

The new timbers were erected in the position required to make the shaft properly vertical, and these, lined with boards, served as forms. Owing to the nature of the rock, it was practicable to remove only one set of old timber at a time, and as soon as the new frame was in position this was filled with concrete consisting of one part of cement, four parts of sand, and four parts of rock crushed to pass a 2-in. ring. These were sent underground in separate lots, mixed at the nearest level, and passed to the required points through wooden pipes. For reinforcing, old drill steel was used for vertical bars, and strands of worn-out hoisting rope, previously annealed, as horizontal binding. The arrangement is shown in Fig. 4.

The added strength obtained by using concrete is at least 15 times that of the Tasmanian hardwood sets, and the ground is also protected from the effects of the atmosphere and moisture, which should materially assist in preventing movement.

The rock removed at the eastern end of the shaft had to be taken out without blasting, and the utmost care

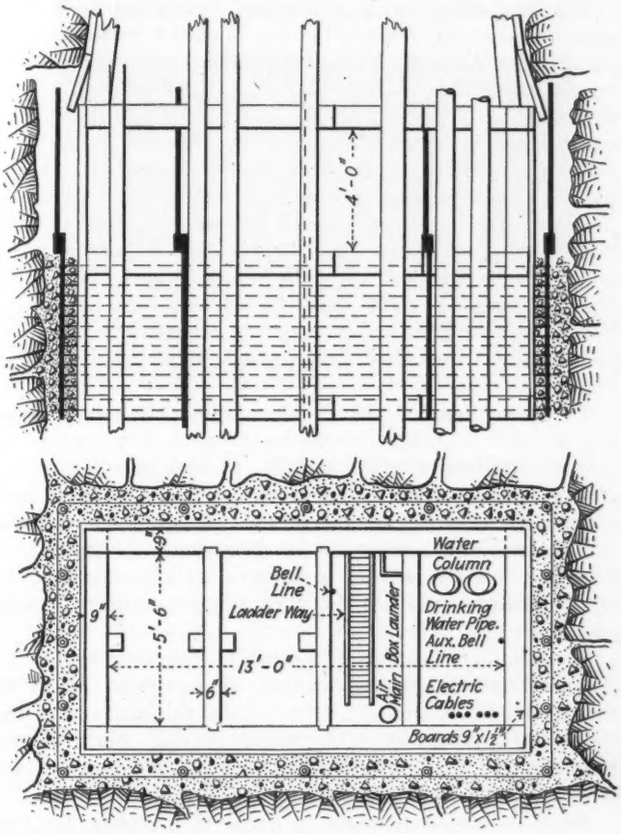


FIG. 4. PLAN AND SECTION OF SHAFT, SHOWING METHOD OF REINFORCING MAIN TIMBERS WITH CONCRETE

exercised to prevent injury to the electric cables conveying power to the drainage pumps, and disturbance of the air and water mains. To provide the required output, it was necessary to continue using the shaft for general hoisting purposes, and the renewals and concreting were carried out during the week ends, when mining operations were suspended.

Keystone Copper Mining Co.

SPECIAL CORRESPONDENCE

The property of the Keystone Copper Mining Co., consisting of 16 claims, situated about two miles from Johnson, and east of the Arizona United Mining Co. in the Johnson-Dragoon mining district, Cochise County, Ariz., has passed from the class of a prospect to that of a mine ready to produce copper. The orebodies which are found in the western part of the district extend as far east as this property.

The main shaft has been sunk 635 ft. It is a two-compartment shaft, perpendicular, and well timbered. Beginning at the third level, stations and ore pockets have been cut, 100 ft. apart. These have been well timbered and completed ready for use. From close observation, it appears that the company adopted the "safety-first" plan when sinking was started.

In drifting north-east from the shaft on the third level, ore was struck. This was followed 60 ft. on the hanging-wall side. At this point the vein was crossed by another vein. No development work has been done on this vein as yet, but on the first one mentioned a raise was run 25 ft., a winze sunk 50 ft. and a crosscut run 26 ft., which has not struck the foot wall. The ore in all these places, which is a sulphide, has averaged better than 3½% copper.

On the fourth level the ore is of the same character. Very little work has been done at this point, so the extent of the vein is undetermined. On the sixth level a red-oxide ore, running 10% copper, has been found. This is the only place in the district that this class of ore has been encountered. At present the company is working one shift, doing development. No ore will be hoisted except what is necessary, from drifts and raises, until the mill is ready for operation. This mill will be of 100-ton capacity, using concentration and flotation. Tests are being made at the present time; and, as soon as the plans are received from the engineers, work will begin on this concentrator, which will be the first one in the district.

The equipment at this shaft consists of a 30-hp. hoist and an Ingersoll-Rand belt-driven compressor, run by a 40-hp. gasoline engine. Ingersoll-Rand Jackhamers are

THE KEYSTONE COPPER MINE.

used for all underground drilling, larger drills being unnecessary, as the formation is such that the small drills do satisfactory work. Although the ground is soft, it needs few timbers.

The Miller incline shaft on the O.K. claim of this company is down 375 ft. At 150 ft. from the surface this shaft runs into a high-grade sulphide copper ore, which has been continuous from that point to the present depth. Owing to a break in the machinery, this property has been shut down for the last two months. The shaft will be sunk to a greater depth. All ore taken out of the Miller shaft has been shipped to the smeltery and gave good returns. On resumption of work, the ore will be stored on the dump, and as soon as the copper market returns to normal it will be shipped. This shaft is equipped with a gasoline engine direct-connected to a compressor. An air hoist is used to do all hoisting.

W. W. Miller, president and manager of the company, is in charge, and has direct supervision of all work. The general office is at Newton, Kan. T. C. Miller is secretary.

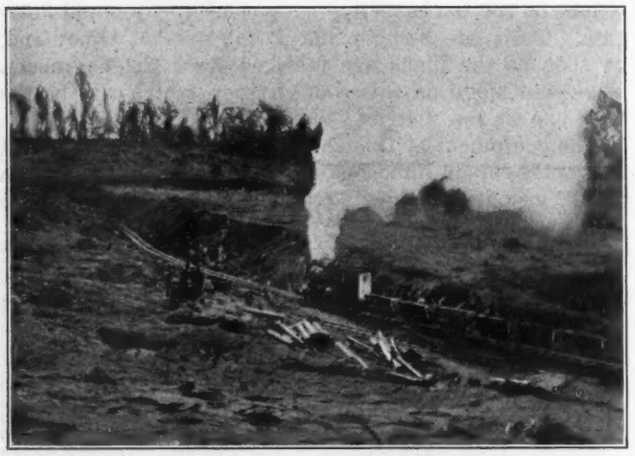
British Import Restrictions.—According to a cable dispatch from the Consul General at London, dated May 16, zinc oxide, which is included on the British list of restricted imports, may now be imported up to 50% of 1913 importations, this being an amendment of a decision already published.

Bauxite Mining in Arkansas

BY TOM SHIRAS*

ARKANSAS produces more bauxite ore than any other state in the Union, and probably as much as is produced by the rest of the entire world. The latest statistics available, prepared by Miss H. M. Gaylord, of the U. S. Geological Survey, published June 21, 1918, in a bulletin on bauxite and aluminum, by James M. Hill, show that in 1917 Arkansas produced 506,556 long tons, valued at $2,724,007. Georgia, Alabama, and Tennessee, in the same year, produced 62,134 long tons, valued at $395,051.

The American Bauxite Co., of Bauxite, Ark., in Saline County, operating a number of mines in the vicinity of Bauxite, is the largest producing company in the



ONE OF THE NUMEROUS BAUXITE MINES IN THE AMERICAN BAUXITE CO. PROPERTY

state. Modern and efficient methods are employed in every department, and in looking over the property one is immediately impressed by the fact that the company is more than a mining concern—it is an institution operated not only for the benefit of the stockholders, but for the benefit of the employees and the community as well. The entire property, covering several thousand acres, is under the direct management of Gen. J. R. Gibbons, a pioneer in the bauxite industry in Arkansas.

Bauxite is not a town, but a community, consisting of a number of villages scattered over the company's holdings. The houses occupied by the employees are owned by the company. They are neat, modern cottages, equipped with electric lights, water, natural gas, and telephones, and are rented at low rates. The company maintains one of the most modern hospitals in the state; and its moving-picture theater compares favorably with similar places of entertainment in larger cities. A bank and a number of business houses are also situated at Bauxite, but are not operated by the company.

Between 400 and 500 men are employed in the various departments on the property. When operations are being carried on to capacity, the employees on the pay roll number from 1100 to 1200.

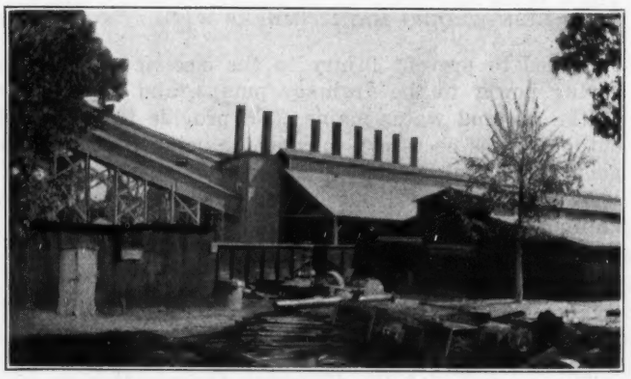
Besides the mines and plant, the company owns and operates a short-line railroad, known as the Bauxite and Northern R.R., which runs from Bauxite to Gibbons and to Bauxite Junction, a distance of three and one-half miles, where it connects with the Missouri Pacific R.R., over which the ore is shipped. The output of the company is sold to the Aluminum Ore Co., of East St. Louis, and to various other consumers.

The orebodies lie in a blanket formation in a clay gangue, and are mined, by the open-pit method, with steam shovels and pick-and-shovel miners. The ore is encountered from grass roots to a depth of 150 ft., the deposits being from 1 in. to 30 ft. in thickness. The overburden is removed with steam shovels, teams and scrapers. Five steam shovels are employed by the company in the stripping and mining operations. The ore-bearing pits or mines are all within a radius of two miles from the plant. Tracks are laid in all the pits, which are connected with the plant by ground trams, the ore cars being moved with locomotives. All orebodies are sampled and assayed as soon as encountered, to ascertain the grade before mining operations are begun.

The treatment of the ore is simple. It comes from the ground in pieces weighing from a few ounces to several hundred pounds, and is crushed to a maximum size of 1½ in. There are seven Gibbons crushers, designed by General Gibbons, and four big gyratories, with a combined capacity of 2000 tons a day. The crushers are driven by a battery of gas engines, in which natural gas is used, and by an auxiliary steam plant.

The product from the crushing department goes to the drying department, which is equipped with 10 rotary driers, 5 x 60 ft.; two, 7 x 30 ft.; and one drier 3½ x 30 ft., where it is thoroughly dried. Natural gas is used in some as the heat-producing agent and pulverized coal in the remainder.

As soon as the product is dried it is ready for the



THE AMERICAN BAUXITE CO.'S PLANT AT BAUXITE, ARKANSAS

market. It is moved from the drying department by a Peck carrier, or link-belt conveyor, to the foot of two inclines that lead, respectively, to two steel ore-storage bins, each having a capacity of 750 tons. At the foot of the inclines the product is discharged to conveyor belts, one leading to each bin. The ore is loaded into freight cars with a Gibbons loader, which automatically distributes the load evenly to all parts of the car.

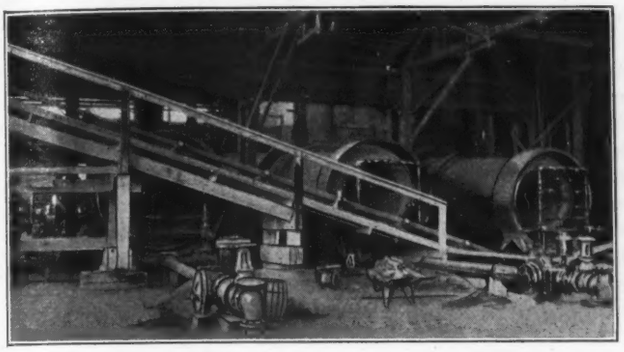
In the bulletin previously mentioned and published by the Geological Survey on June 21, 1918, James M. Hill says:

"The American Bauxite Co., Globe Bauxite Co., E. I.

*Mountain Home, Arkansas

du Pont de Nemours Co., and Republic Mining and Manufacturing Co. mined bauxite from deposits in Saline and Pulaski counties. The largest production was made from the deposits near Bauxite, in Saline County.

"The production from Arkansas in 1917 showed an increase of 35% over the production in 1916, and it is believed that, should the demand arise, the Arkansas deposits are capable of much greater output and contain considerable reserves. The bauxite mined from the Arkansas deposits is of high grade, as is shown by the fact that more than 71% of the output in 1917 was used for the manufacture of aluminum, nearly 19% for abrasives, 9% for chemicals, and 1% for refractories.



SHOWING A SECTION OF THE DRYING DEPARTMENT

"The market for bauxite in the United States is east of the Mississippi River, the largest consumers being in or near the cities of East St. Louis, and Aurora, Ill.; Detroit, Mich.; Cincinnati, Ohio; Knoxville, Tenn.; Philadelphia and Erie, Penn.; Niagara Falls and New York City, N. Y.; and Boston, Mass. Recently a number of municipal and industrial waterworks have installed small plants for the manufacture of aluminum sulphate for local use in purification of water.

CONVEYOR WHICH CARRIES THE PRODUCT FROM THE CRUSHING TO THE DRYING DEPARTMENT

"Bauxite is graded according to its chemical composition and is sold to the consuming industries on the basis of analysis. Apparently, low content of silica and titanium is essential to the aluminum industry, but the content of iron can be fairly high, though bauxites low in iron and titanium are preferred by the makers of alum and aluminum sulphate. Makers of abrasive appear to be able to use bauxites of lower grade, and containing larger proportions of silica and iron, than are permissible in bauxite for other uses, but most abrasives are made from bauxites low in iron and silica. The bauxite used for refractories must be low in iron.

"The prices received for bauxite in 1917, as reported by producers, ranged from $4.75 to $10.50 a long ton. The average price paid for the whole of the domestic bauxite sold in the country was $5.48 a long ton at shipping point.

"The bauxite from all localities in the United States, though it may vary in chemical composition, is on the whole similar in general appearance, with the exception of the 'granitic bauxite' of the Arkansas field. The greater part of the American bauxite appears to be made up of rounded pebble-like bodies set in a fine-grained matrix, which may also consist of small rounded particles which may be as fine grained as the finest clay. The pebble or pisolite form is so general that it is the conspicuous characteristic of American bauxite.

STEEL STORAGE BINS

"There is only one way to determine the value of bauxite, and that is by chemical analysis, which should show total silica, alumina, titanium oxide, iron oxide, and water. Bauxites of commercial grade should carry at least 52% alumina."

Metallurgy of Quicksilver—The ores of quicksilver, unlike those of most metals that are won by smelting, are without exception in this country, according to F. L. Ransome in *Bull.* 666-FF, U. S. Geological Survey, treated at the mines, and the liquid metal is shipped as a finished commercial product in iron bottles or flasks containing 75 lb. each. A moderate heat, about 360° C., is enough to vaporize and decompose cinnabar, and the quicksilver is obtained directly by condensation in suitable chambers through which the fumes from the furnace are conducted. There are two classes of reducing apparatus—furnaces and retorts. In most furnaces the ore is exposed to the direct action of the flame; the volatile products of combustion, with more or less dust, mingle with the vapors of sulphur and mercury driven from the ore, and all pass together through condensers. The operation is in general continuous. In retorts, on the other hand, the ore is heated in a closed iron vessel, out of contact with the flame, and only those volatile constituents that are released from the ore pass into the condensing apparatus. In most retorts the operation is intermittent.

Transformers for Induction Motors*

By J. B. GIBBS†

IN SELECTING transformers to be used with induction motors, there is a large field for the exercise of good judgment. The transformers must not be too small, or they will burn out when the motor is loaded. If they are too large, there are unnecessary energy losses in the system and unnecessary investment in the transformers. So it is important to know what should be expected of motors and transformers and how to group them.

Probably the most common case will be where a motor wound for 220 or 440 volts is to be run from a power line at 2200 volts. Transformers for this kind of service are built in two classes. The first class has its low-voltage winding divided into two parts, which may be connected in series for 220 volts, or in parallel for 110 volts. The second class has the low-voltage winding in two parts, which give 440 volts when connected in series and 220 volts when connected in parallel. Fig. 1 shows the development of the winding of a transformer for 2200 to 440 or 220 volts.

The size of transformers to be used with a given motor depends on several factors. According to the Standardization Rules of the American Institute of Electrical Engineers and of the National Electric Light Association, transformers are designed to have a temperature rise of 55° C. above the surrounding air when carrying continuously the load indicated on the nameplate. The reason for this is that if a transformer is situated in a hot place (45° C. or 113° F. is taken as the standard air temperature), and loaded, the coils will reach 45 + 55 = 100° C., which is as high a temperature as the insulation should be called upon to stand continuously.

A motor rarely has an absolutely uniform load, and short-time peaks much above the rating of the transformers will be harmless if the load between the peaks is correspondingly low. Usually, unless the installation is important enough to warrant a test of actual load conditions, the best that can be done is to estimate the size of the transformers required from the size of the motor, and then to inspect them at intervals for a few days or a few weeks to find whether they are getting too hot. If any doubt exists as to the transformers to use, it is better of course, to err on the side of safety.

Another thing that sometimes causes uncertainty is the difference in the way of rating motors and transformers. Motors are always rated in horsepower or in kilowatts—usually in horsepower—and transformers are always rated in kilovolt-amperes. With direct-current motors the product of the volts by the amperes gives the power in watts actually put into the motor; but with alternating-current motors this is not true. With alternating-current motors the product of volts by amperes must be multiplied by another factor, called the "power factor," to give the watts. That is, of two motors to which is being supplied the same amount of power at the same voltage, one alternating current and the other direct current, the alternating current will require more current than the direct-current machine. And as it is current and not power that heats the transformers, they must be large enough to take care of this extra current. The transformers must also supply the losses that take place in the motor itself, which makes it necessary that they be still larger.

Methods for approximating the correct size of transformers for various conditions are given in a subsequent paragraph. They are based on the assumption that the motor will carry about full load and will have an efficiency and power factor as good as a typical modern induction motor. The simplest case of alternating-current motor connection is a single-phase motor, as shown in Fig. 2. Two wires are run from the secondary of the transformer through fuses and a switch to the motor. Small motors are usually connected to the lighting circuits and treated as a part of

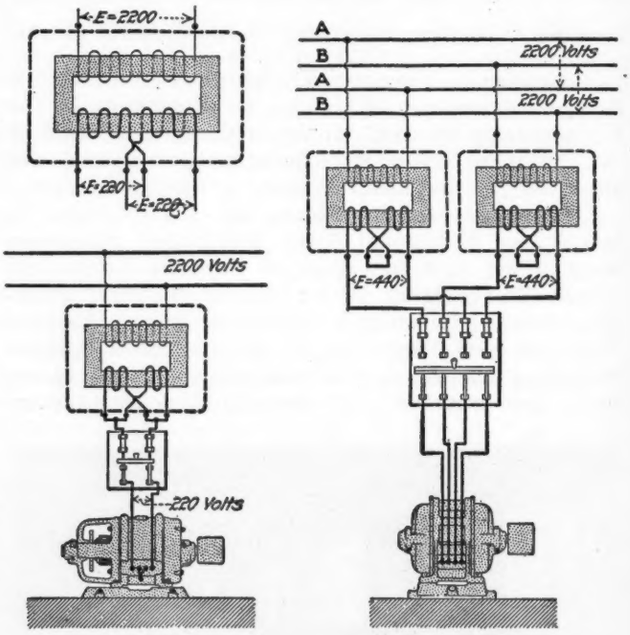


FIG. 1 TO 3. DIAGRAMS OF TRANSFORMER AND INDUCTION-MOTOR CONNECTIONS

Fig. 1. Upper left-hand corner: diagram of transformer connections. Fig. 2. Lower left-hand corner: diagram of single-phase motor connected to transformer. Fig. 3. On the right: diagram of a two-phase motor connected to two transformers.

the lighting load, but the larger sizes are likely to cause flickering of the lights, and are therefore better run from separate transformers. Single-phase motors are built in sizes ranging from a small fraction of a horsepower up to about ten horsepower. The approximate size of transformer for a single-phase motor may be found from the formula,

$$kv.\text{-}a.\ of\ transformer = hp.\ of\ motor \times 1.25$$

In most cases where power is required it can be better supplied by polyphase motors than by single-phase motors, because the former are cheaper, have better operating characteristics, and are more sturdy and reliable. As a rule, the larger the motor the higher will be both its power factor and efficiency. High-speed motors generally have better power factor than slow-speed motors, and 25-cycle motors have better power factor than corresponding 60-cycle motors. As a rough general rule, which is easy to remember, it may be said

*Abstracted from *Power*, May 20, 1919.

†Engineer, Transformer Department, Westinghouse Electric and Manufacturing Company.

that each horsepower of the motor rating will need one kv.-a. of transformer rating. The figures given herewith are somewhat closer than this, but in order to use standard transformers it will often be necessary to select them larger or smaller than indicated by the figures.

Fig. 3 shows a two-phase motor connected to a two-phase line. In this case two transformers are needed, as shown, and the size of each, if the motor is small (say 25 hp. or less) may be taken as

kv.-a. of one transformer = hp. of motor $\times$ 0.58

For large two-phase motors, say 100 hp. or more, the size of transformers may be found from the expression,

kv.-a. of one transformer = hp. of motor $\times$ 0.46

In operating three-phase motors from three-phase lines, there is a choice of several connections. Fig. 4 shows the open delta, or "V" connection, which is frequently used, especially for motors of the smaller sizes. In this connection the current in the transformers is out of phase with the voltage, so a larger total kv.-a. of transformers is needed than with the delta connection. On the other hand, only two units are needed instead of three, and this is an advantage in installation. For small motors connected as in Fig. 4 the size of each transformer may be found from the formula,

kv.-a. of one transformer = hp. of motor $\times$ 0.67

and for large motors,

kv.-a. of one transformer = hp. of motor $\times$ 0.53

The delta connection, shown in Fig. 5, is also much used for transformers supplying three-phase motors. One advantage of this connection is that in case of trouble with one transformer it can be cut out, and the remaining two transformers will operate in open delta and allow the motor to carry about 58% of its normal load. The size of the transformers for small motors is,

kv.-a. of one transformer = hp. of motor $\times$ 0.39

and for large motors is,

kv.-a. of one transformer = hp. of motor $\times$ 0.31

Another connection frequently used is the star, or "Y," connection, shown in Fig. 6. It is especially convenient where it is desired to run three-phase motors from a three-phase 3800-volt line, using standard 2200-volt transformers. One high-voltage terminal of each transformer is connected to a common junction, and the remaining three terminals are connected to the three line wires, as shown. The size of transformers needed is the same as for the delta connection given in the foregoing.

Sometimes it is desired to operate two-phase motors from a three-phase power line, or vice versa. The usual connection for this case is shown in Figs. 7 and 8. Two transformers are needed, and the three-phase side is provided with special taps. Fig. 7 shows a two-phase motor connected to a three-phase line. The "main" transformer, shown at the left in the sketch, has a lead brought out from the middle point of its high-voltage winding, and this lead is connected to an 86.6% tap on the "teazer" transformer. The other end of the teazer winding is connected to the three-phase line. This causes the voltages in the secondary windings of the two transformers to be 90° apart and equal in magnitude; that is, to be two-phase voltages. The connection of a three-phase motor to a two-phase line is shown in Fig. 8. In this case the special taps are in the low-voltage windings, in the same relative positions as above. For small motors connected according to either Fig. 7 or Fig. 8 the size of transformers is

kv.-a. of one transformer = hp. of motor $\times$ 0.67

and for large motors,

kv.-a. of one transformer = hp. of motor $\times$ 0.53

Small motors are started by closing the main switch and connecting the motor directly to the line, as shown in all the figures, but for large motors this would cause too large a rush of current, so some kind of starting device, or "compensator," is used. This is connected between the motor and the main switch and usually consists of auto-transformers, or choke coils. There are several kinds of compensator on the market, and as a diagram of connections always accompanies the compensator, they are not included in the figures given here.

The direction of rotation of a single-phase motor can

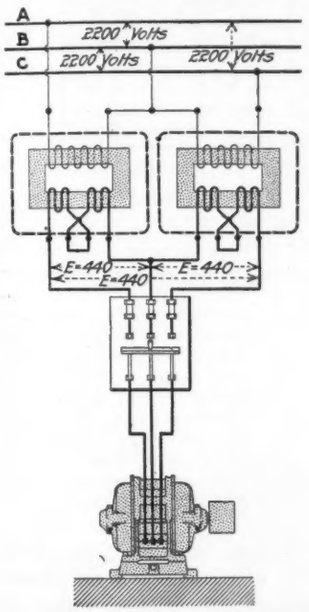


FIG. 4. THREE-PHASE MOTOR CONNECTED TO TWO TRANSFORMERS IN OPEN DELTA

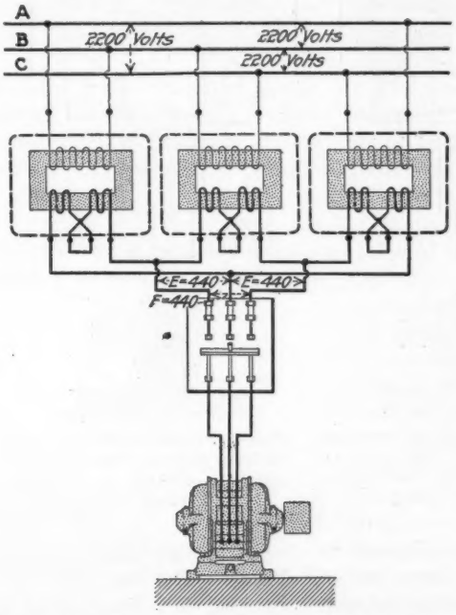


FIG. 5. THREE-PHASE MOTOR CONNECTED TO THREE TRANSFORMERS IN CLOSED DELTA

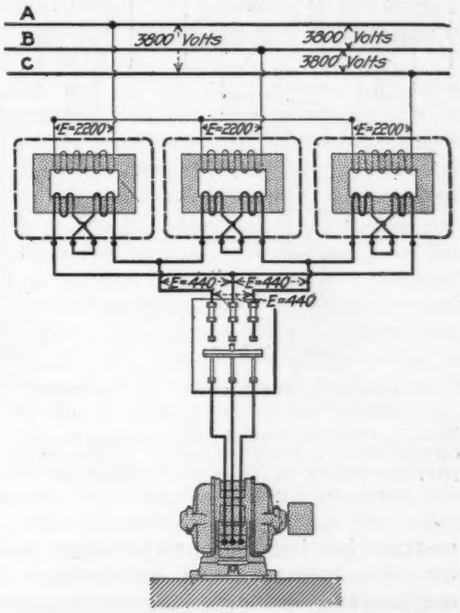


FIG. 6. THREE-PHASE MOTOR CONNECTED TO THREE TRANSFORMERS STAR TO DELTA

be reversed by interchanging the leads of the starting winding or running winding on motors of the split-phase type or by shifting the brushes on motors of the repulsion type. The details of this operation depend on the arrangement of leads, and instructions are always sent with the motor. Two-phase motors may be reversed by interchanging the two leads of either phase, and three-phase motors may be reversed by interchanging any two leads.

A volume might be written on the subject of emergency connections, because there are so many possible emergencies, but the operator must always depend on his own judgment and knowledge. It may be of assistance in forming a judgment in any particular case to point out certain facts and relations.

Two transformers can usually be connected in parallel to give an output equal to the sum of their ratings. This is true especially if the two transformers were built by the same manufacturer and are not too far different in size. For instance, a 10-kv.-a. transformer would probably operate satisfactorily in parallel with a 5-kv.-a. or a 25-kv.-a. or any size between the limits, but it might be doubtful wisdom to connect a 5-kv.-a. in parallel with a 100-kv.-a. unit. In some cases the characteristics of large transformers are such that they will not divide the load in proportion to their ratings when connected in parallel. This merely means that the output of the bank is limited by the transformer which takes more than its share. In case of doubt it is well to ask the manufacturer whether the two transformers in mind are suitable for operation in parallel, although this is seldom necessary for transformers smaller than 100 kv.-a.

In making a parallel connection between transformers it is always well to check their polarity, especially if they were made by different manufacturers. This may conveniently be done as shown in Fig. 10. Connect one transformer to the primary and secondary lines, as shown at the left of the sketch, and connect the other transformer to the primary line and to one side only of the secondary line. Now take a voltmeter, or incandescent lamps, and test between the open side of the transformer and the other secondary line wire as shown. If no voltage is indicated, the connection is correct and may be completed. If the voltmeter shows a reading or the lamps light, the leads of the second transformer must be reversed.

Two-phase motors may sometimes be run from three-phase lines using standard transformers. For the "main" transformer select one which has its primary wound for 2200 or 1100 volts, series-parallel, and for the "teazer" transformer one which has two 5% taps in the primary. These are both standard arrangements, and the ordinary central station usually has both kinds. The two transformers are connected as shown in Fig. 9. This gives a two-phase voltage which is unbalanced and which consequently puts the motor at a disadvantage; but it will enable the motor to run and may sometimes save a long delay in getting the proper special transformers.

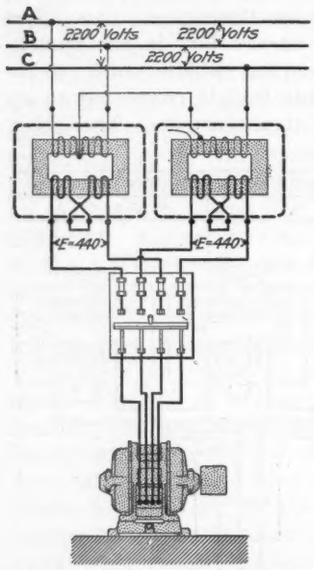


FIG. 7. CONNECTIONS FOR OPERATING A TWO-PHASE MOTOR FROM A THREE-PHASE LINE

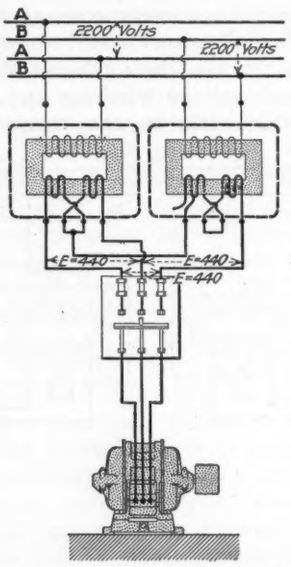


FIG. 8. CONNECTIONS FOR OPERATING A TWO-PHASE MOTOR FROM A TWO-PHASE LINE

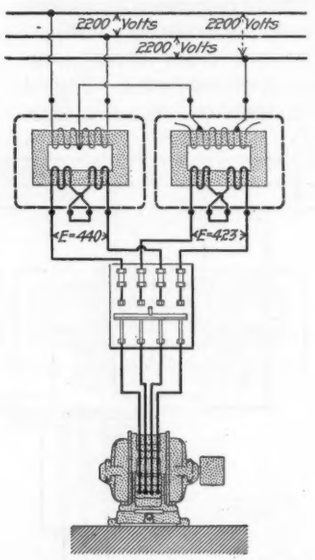


FIG. 9. CONNECTIONS FOR OPERATING A TWO-PHASE MOTOR FROM A THREE-PHASE LINE

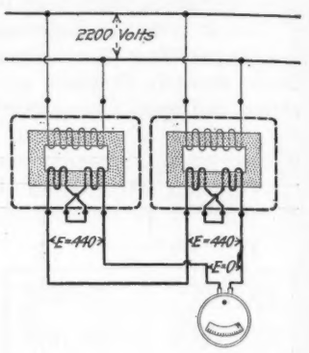


FIG. 10. METHOD OF CHECKING PARALLEL-CONNECTED TRANSFORMERS. IF LAMPS ARE USED FOR THIS TEST, ENOUGH SHOULD BE CONNECTED IN SERIES TO TAKE UP DOUBLE THE VOLTAGE FOR WHICH THE TRANSFORMERS ARE CONNECTED

Swedish Iron and Steel Production

The output of iron and steel in Sweden in 1918, according to statistics compiled by the Association of Swedish Iron and Steel Works, and republished by *Iron Age*, was as follows in metric tons, as compared with that of 1917:

SWEDISH IRON AND STEEL OUTPUT

	1918	1917
Pig iron and direct castings	749,800	821,200
Puddled iron, blooms, etc.	92,000	114,100
Bessemer ingots	66,500	76,900
Openhearth ingots	458,300	489,700
Rolled and forged iron and steel	361,400	378,000

(Crucible and electric ingots were not given separately.)

In 1918 Sweden exported 4,486,000 tons of iron ore, as compared with 5,613,000 tons in 1917. The pig-iron exports were 180,113 tons in 1918, as against 231,244 tons in 1917. The total iron and steel exports in 1918 were 183,753 tons, which compare with 230,204 tons in 1917 and 299,086 tons in 1916.

Manganese Ore Production in Tunis amounted to 5800 metric tons in 1917, compared with 2027 tons in 1916 and 1460 tons in 1915, according to the *Ironmonger*.

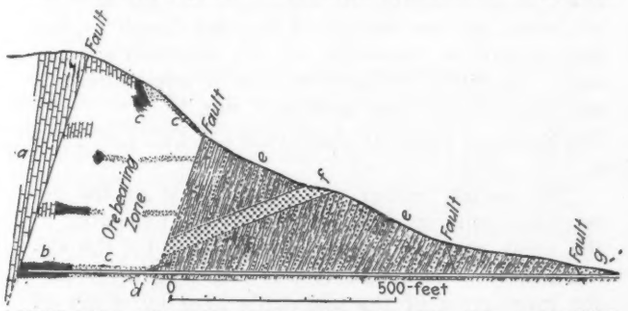
Geology and Ore Deposits of the Yerington District, Nevada*

REVIEW BY WILLIAM H. EMMONS†

THE hope that Yerington would develop into a copper district of the first class, which was held by many a decade ago, has not been realized. The Yerington district produced, nevertheless, from 1912 to 1917, inclusive, 61,200,000 lb. of copper, which places it well to the front among American copper-bearing areas of the second order.

Mr. Knopf's discussion of the geology of the region is brief but comprehensive, well balanced, and adequate for the treatment of the deposits that follows. His discussion of the genesis of the deposits is thorough and scholarly.

The region described is mainly in the Singatse Range and comprises an area of about 156 square miles. The oldest rocks, of Triassic age, include andesites, soda-rhyolite felsites, and limestone, with subordinate quartzite, shale, and gypsum. The beds are 8000 ft. thick, of which volcanic rocks make up 3200 ft. They were invaded, probably early in the Cretaceous, by basic granodiorite and soon after by quartz monzonite. These in-



GEOLOGIC SECTION THROUGH TUNNEL NO. 4, MASON VALLEY MINE.

A, Limestone; B, Ore; C, Garnetiferous rock; D, Basic dikes; E, Lime-silicate rocks with intercalated felsites; F, Quartz monzonite porphyry; G, Tertiary rhyolite.

trusions metamorphosed the rocks which they invaded, causing andesites and felsites adjacent to them to recrystallize, and converting limestone into calcium silicate rocks, among which garnetites predominate.

Probably one-half of the Triassic area consists of rocks made up of garnet, wollastonite, and allied silicates. Subsequently dikes and bosses or quartz monzonite porphyry were injected. Faulting followed, breaking and displacing the dikes. Along some of the faults formed at this time metalliferous solutions rose and deposited the copper ores. The Tertiary rocks rest uncomformably on the Mesozoic rocks. They are dominantly volcanic and are at least 7000 ft. thick.

An interesting feature of the geology of the sedimentary rocks is a bed of gypsum, over 400 ft. thick, near the Ludwig mine. This was described in 1912 by Rogers, who regarded it as an alteration of anhydrite. It is probably the most extensive deposit of gypsum so formed that has been described. In his discussion of this unusual deposit, Knopf agrees with Rogers as to its derivation.

The principal orebodies consist of pyrite and chalcopyrite in a gangue of pyroxene, garnet, and epidote. They attain 800 ft. in length and 100 ft. in width. These dimensions, however, are exceptional, and as a rule are applicable to the ore-bearing zones, in which the orebodies are commonly small fractions of the associated masses of barren garnet-pyroxene rock. In the Mason Valley mine, masses of barren garnet rock, in places 200 ft. thick, underlie the productive part of the ore-bearing zone. The known vertical range of mineralization in the district, in the present stage of development, is 950 feet.

The ore deposits are contact metamorphic replacements of limestones. As the replacement of the limestone extended outward from fault fissures, the orebodies, as a rule, are lodelike in form. The ore tends to occur on the limestone side of the ore-bearing zone.

The orebody at the Bluestone mine, consisting essentially of chalcopyrite and epidote, differs from other deposits of the district in that it was not formed by the replacement of limestone but of brecciated garnetite and other contact-metamorphic rocks of the first period of metamorphism. Its features emphasize the two periods of metamorphism distinguishable in the district, which occurred during the same general epoch of intrusion—an earlier, widespread metamorphism marked by the addition of the immense quantities of silica and iron to the metamorphosed limestones, and a later, localized metamorphism marked by the addition of silica, iron, copper, and sulphur. This feature of the metamorphism of the garnetite in the Bluestone mine, and the deposition of ore in the shattered garnet rock, is similar to that in the ore zone of the Cable mine, near Anaconda, Mont., which I investigated some years ago. Blocks of garnet rock and granite in the contact zone at Cable are cemented by a gold ore containing calcite, quartz, pyrite, pyrrhotite, and other minerals.

The alteration of igneous rocks by the contact metamorphic solutions from later igneous rocks forms an interesting subject of discussion. There is, however, no garnetization of igneous rocks attended by deposition of ore of the contact metamorphic type like that described by Spurr and Garrey at Valardeña, Mexico. The alteration is attended by development of hornblende, an alteration like that exhibited at Cananea and Morenci and certain other districts.

On the whole, the contact metamorphic replacements of limestone at Yerington have a more obvious relation to faulting than is generally exhibited when deposits of this type are developed. At many places the metalliferous solutions seem to have traversed the intergranular spaces between mineral grains or the cleavage cracks of minerals, for evidences of major fractures such as might have served as paths for them, in many districts at least, are wanting.

The presence of limestone has favorably influenced the precipitation of ore. The main orebodies are in the limestone adjoining the faults, but, with the deposition of the ore, large bodies of garnet and pyroxene were formed, which in amount greatly exceed the ore. To

*By Adolph Knopf, Professional Paper No. 114, U. S. Geological Survey.

†Professor of geology and director of the Minnesota Geological Survey, University of Minnesota, Minneapolis, Minnesota.

find the bodies of ore in this unprofitable envelope is one of the most difficult problems of the miner in many districts containing ores of contact metamorphic origin. Umpleby showed that ore is most likely to occur on the limestone side of the contact-metamorphic zone in copper deposits at Mackay, Idaho,[1] and in certain other districts. Knopf finds that this rule, with some exceptions, will hold at Yerington, as the ore tends to occur in the marginal portion of the contact-silicate rock where this borders the limestone. This tendency shows most clearly in the orebodies of the Mason Valley and Casting Copper mines. Any data bearing on this inquiry is valuable, for all who have puzzled over the localization of oreshoots in the contact-silicate zones will recognize the difficulties inherent in the problem.

There is evidence of the addition of much silica, iron, sulphur, and other elements by contact metamorphism of the limestone. That the replacement of limestone by garnet is attended by little or no increase or decrease in volume is attested by the presence of a completely garnetized undistorted fossil (Holobia) in the contact metamorphic zone. Large increase or decrease in volume by contact metamorphism would have ruptured or distorted any fossils contained.

The primary ores of the district are essentially unenriched by later sulphides, supergene covellite and chalcocite being, on the whole, of minor importance.

Legal Aspect of Tailings Disposal

BY CHESLA C. SHERLOCK*

One of the first purposes of the law is to afford protection to property and to insure its proper use and enjoyment. It is an elemental principle that every person has a right to the free enjoyment of his own property, but that no one may exercise a right upon his own property which will curb or interfere with the rights and privileges of another. It is a well-quoted maxim which says, "The rights of one man end where those of another begin."

In mining operations, débris often finds its way onto the land of adjoining or neighboring owners, being dumped there, or carried by the streams over the adjoining land.

The deposition of tailings is, to a reasonable extent, permitted in running streams, but it is subject to limitations. It has been repeatedly held that this doctrine does not extend to authorizing the miner to flood the lands of another, or to deposit mining débris to the extent that it will deprive the neighboring owner of a substantial right, or depreciate his property.

In a California case (Hobbs *vs.* Amador & Sacramento Canal Co., *66 Cal. 161, 4 Pac. 1147*), a decision supported in Oregon and Missouri, the court held: "No person, natural or artificial, has a right, directly or indirectly, to cover his neighbor's land with mining débris, sand, gravel, or other material so as to render it valueless."

It is conceded that a miner has a right to use the channel of a stream for the disposal of tailings, refuse, or débris, but he has no right to fill the channel so that the water will overflow and thereby cause the débris or other material to be deposited on the land of a lower holder. It has been expressly held in both California and Oregon that a mine operator or owner has a right to use his claim in a lawful manner, but that no use which prevents others from enjoying their rights can be considered as lawful.

The degree of care or caution that a miner exercises, in his work, to prevent débris reaching the land of another is immaterial. He has violated the right of another if actual injury is done. Miners often attempt to justify themselves by asserting the "doctrine of necessity," but the Oregon court has said that it has no application to these cases.

California and Idaho courts have said that, though the doctrine of necessity may permit one to enter the lands of another in order to reach his own land, it does not extend to the point of allowing him to erect flumes, ditches, and buildings thereon and thereby discharge tailings from his own land. Lindley, a recognized authority, states that this doctrine is not applicable to any particular locality, but that it is generally conceded to have universal application.

In an Ohio case (*48 Ohio St. 41, 26 N. E. 630, 633*), the court said:

> "The claim of the company that it had a right to make the deposits in the places complained of, because it was necessary to the successful conduct of its business, seems wanting in substance. The effect is to measure the rights of the plaintiff in his lands and the waters of Monday Creek by the convenience or necessity of the company's business. An owner of land in Ohio is not subject to any such narrow and arbitrary rule."

The Supreme Court of California (*57 Cal. 413, 40 Am. Rep. 118*), said:

> "The refuse matter was the product of the defendant's mining operations, and was deposited in the creek through agencies controlled by the defendant; and although it was not responsible for the inundation of the plaintiff's land by water of said creek, it was responsible for the deposit of the deleterious substance with which said water was charged through its agency upon said land. This does not in any manner involve the question of the defendant's right to mine or prosecute any other legitimate business on its premises. It would not be claimed that the defendant could convey and deposit said refuse matter from its mines by means of carts and cars, without increasing its liability for any damages which the plaintiff might suffer by reason thereof. And we know of no principle upon which it could be held that a person may escape liability by doing that indirectly which would render him liable if done directly."

The U. S. Supreme Court has held that where property is thus actually invaded so as to impair or destroy its value it is, in fact, taking property without compensation. Very often, in these cases, it is urged that the right of a miner to deposit refuse matter has been sanctioned so long by custom and usage that it is not proper for the courts to change the custom or announce doctrines contrary to it. But a careful examination of the law, both at common law and under the statutes, discloses the fact that no such custom was ever in existence, or was ever recognized either under common law or the statutes. In fact, if any such custom could be designated as a mining custom it did not sanction such doctrine. It is true, however, that cus-

[1]Umpleby, J. B., "The "Occurrence of Ore on the Limestone Side of Garnet Zones," University of California, Department of Geology Bulletin, Vol. 10, pp. 25-37, 1916.

*Box 84, University Place Station, Des Moines, Iowa.

tom might have permitted the fouling or pollution of streams to a certain extent, but this never extended to the right of one to cause sand, gravel, or débris to be deposited on the land of another. In a Montana decision, the court said:

> "A mining custom which would allow the total destruction of a junior locator's mining operations in a gulch below prior locators, on ground which was vacant, cannot be maintained under any statute or common mining law with which we are acquainted."

The Colorado statute seems to be a clear statement of the law as it existed before the statute was enacted. The act merely announced in statutory form what the law was prior to its adoption. This statute reads: "In no case shall any person or persons be allowed to flood the property of another person with water, or wash down the tailings of his or their claim upon the claim of another person, but it shall be the duty of every miner to take care of his own tailings, or become responsible for all damages that may arise therefrom."

In another case, the U. S. Supreme Court has said: "No system of law with which we are acquainted tolerates the use of one's property in any way so as to destroy the property of another." It is well to note that this doctrine applies to any process by which foreign matter may be conveyed to the land of another and is not confined simply to instances where the débris is conveyed by means of deposit in a stream. Speaking of custom, the California court said:

> " . . . a legitimate private business founded upon a local custom may grow into such a force as to threaten the safety of the people, and destruction to public and private rights; and when it develops into that condition the custom upon which it is founded becomes unreasonable, because dangerous to public and private rights, and cannot be invoked to justify the continuance of the business in an unlawful manner."

It is generally admitted by all persons that no one would have a right to take refuse matter from his own land and dump it upon the land of another. That would be what is called directly depositing the refuse matter. That is clearly unlawful. In like measure, no person as a right indirectly to do something which he would not be legally permitted to do directly. When considered in this light, it is at once apparent that the deposit of mining débris is unlawful.

Chrome Ore in South Africa

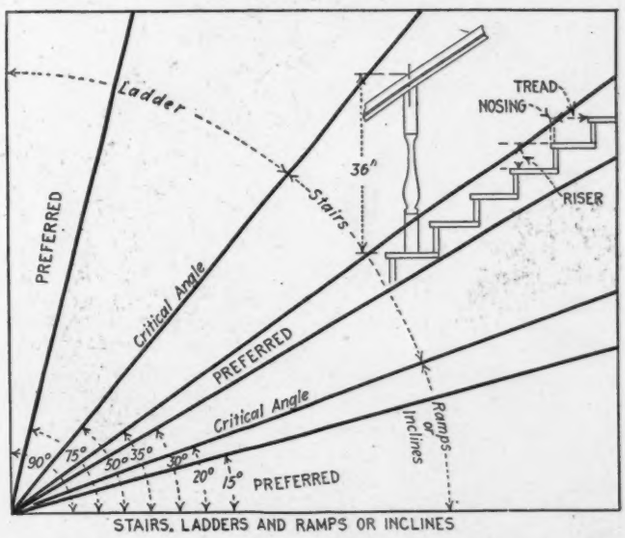
The South African chrome-ore supply is hampered considerably by the difficulty in getting it to the market over the railroads, for want of cars, and some of the ore deposits are a considerable distance from any line of railroad, all of which limits delivery at any given port. The deposits in South Africa are in the Transvaal and Rhodesia, according to Consul W. W. Masterson, of Durban, Natal, in *Commerce Reports*, and the largest chrome-ore area, with the highest percentage of chrome oxide, is in Rhodesia.

The chrome ore of the Transvaal runs between 40 and 50% chrome oxide, though there are certain deposits partly developed in Rhodesia, in which the chrome oxide is over 60%, making it about the richest chrome ore deposit in South Africa, if not in the world. In common with many other mining ventures, the industry is closely controlled, the business being in the hands of what is called the chrome-ore ring, which refuses to buy ore from any privately owned property, and as the greater portion of the ore property in private hands is at considerable distance from the railroads, the richest deposits being from 25 to 30 miles distant, it is probable that all the chrome ore deposits will eventually be absorbed by the ring.

Another serious inconvenience is the long haul of the ore from its deposit to the seacoast. The government of South Africa has been badly hampered during the war for want of freight cars, and this shortage has persisted to such an extent that the port of Durban cannot always fill its coal orders. This shortage of cars must be taken into consideration in connection with the exportation of chrome ore in any quantity. The closest and most convenient port to the ore fields is at Beira, Portuguese East Africa, but the other ports, Lourenço Marquez, Durban, and Cape Town, also are in railway communication with the chrome deposits.

Inclination of Ladders and Stairways

The accompanying illustration giving critical and preferred angles for ladders, stairways, and inclines, has been reproduced from a pamphlet issued by the



ANGULAR INCLINATION OF STAIRWAYS AND LADDERS

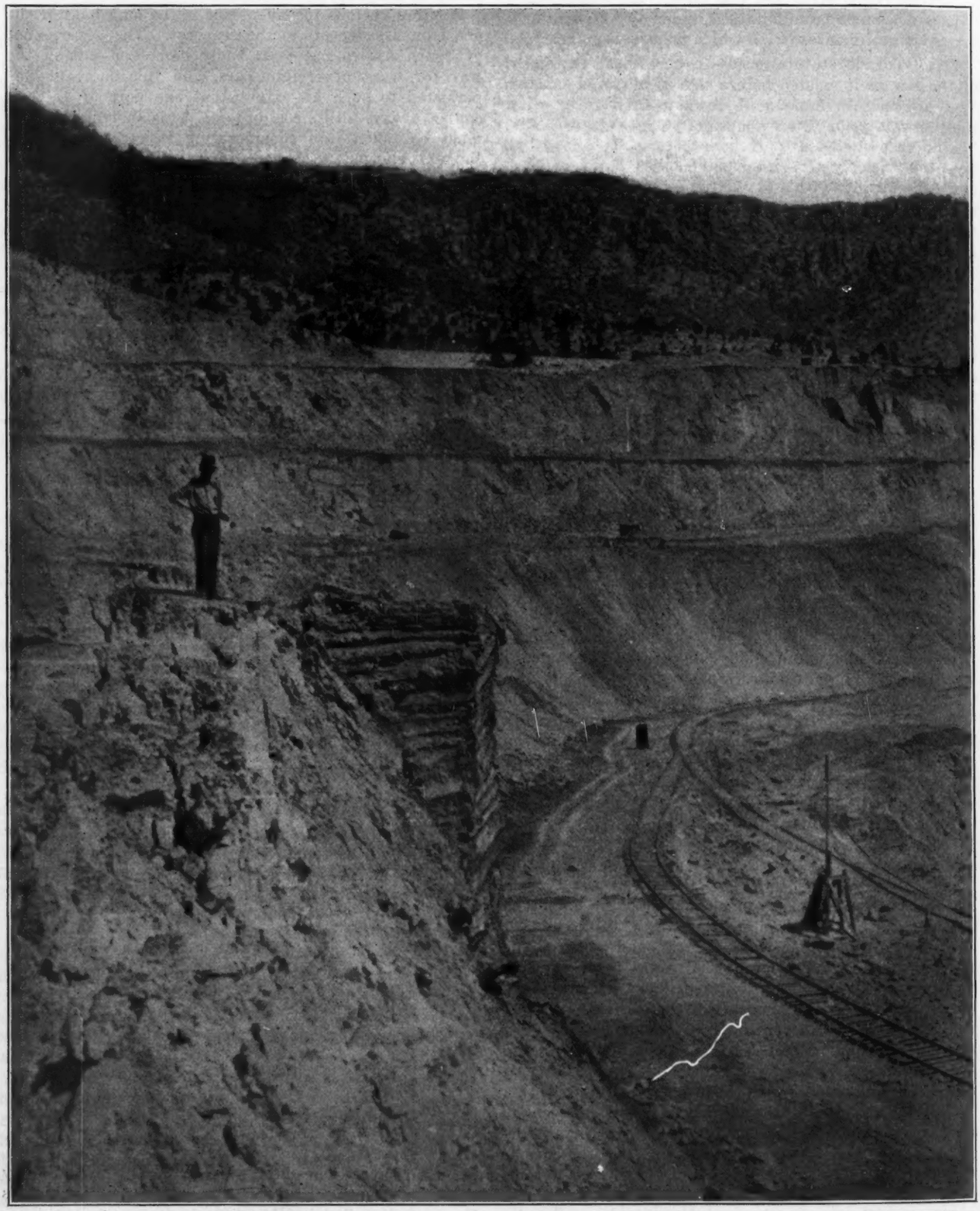
American Abrasive Metals Co.. of 50 Church St., New York. It will be found useful for reference.

The table gives dimensions for risers and treads for stairways. The data were originally prepared by the safety engineering department of the Workman's Compensation Service Bureau.

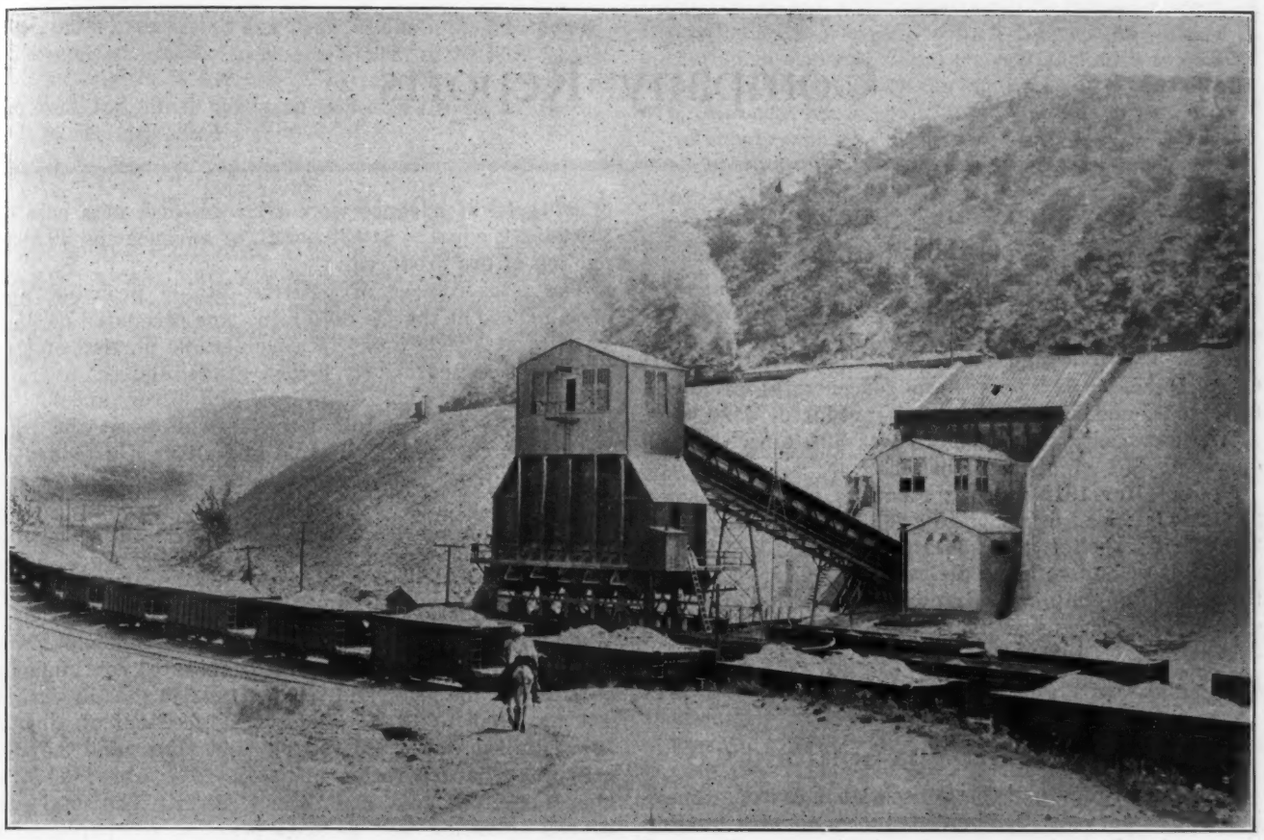
TABLE OF RISERS AND TREADS FOR STAIRS
(Tread + Riser = 17½ Inches)

Angle With Horizontal	Riser in Inches	Tread in Inches
22°-00′	5	12½
23°-14′	5¼	12¼
24°-38′	5½	12
26°-00′	5¾	11¾
27°-33′	6	11½
29°-03′	6¼	11¼
30°-35′	6½	11
32°-08′	6¾	10¾
33°-41′	7	10½
35°-16′	7¼	10¼
36°-52′	7½	10
38°-29′	7¾	9¾
40°-08′	8	9½
41°-44′	8¼	9¼
43°-22′	8½	9
45°-00′	8¾	8¾
46°-38′	9	8½

Chino Copper Company, New Mexico



OLD SHAFT SUNK BY SPANIARDS AND EXPOSED BY STEAM-SHOVEL OPERATIONS AT THE HEARST PIT OF THE CHINO COPPER CO., SANTA RITA, NEW MEXICO



COARSE-CRUSHING PLANT AND FINE-ORE BINS OF CHINO COPPER COMPANY

EAST SIDE OF HEARST PIT OF CHINO COPPER COMPANY, SANTA RITA, NEW MEXICO

Company Reports

Judge Mining and Smelting Co.

Mine development of the Judge Mining and Smelting Co. during 1918 consisted of drifts and crosscuts, 3223.4 ft., and raises, 2537.5 ft. Milling ore amounting to 47,835 tons and 10,271 tons of shipping ore were mined. The following mill operations were reported: Ore treated, 40,622 tons; lead concentrates produced, 6700 tons, and zinc concentrates produced, 4580 tons. Average capacity per 24 hours was 404 tons, the mill operating 351 eight-hour shifts.

Receipts for 1918 were as follows: Crude ore sales, $335,244.08; lead concentrates, $366,157.09; zinc dross, $34,497.10; spelter, $261,861.46; residues, $63,882.21, and interest and sundry receipts, $28,700.18. Expenditures, including mining, milling, and reduction expenses, exploration, ore expense, taxes and miscellaneous, totaled $912,001.52. Dividends amounting to $240,000 were paid. The balance on hand Jan. 1, 1919, was $72,180.27.

Consolidated Arizona Smelting Co.

The annual report of the Consolidated Arizona Smelting Co. for the year 1918 indicates that, notwithstanding the constantly increasing costs of labor, supplies, and freights, the copper was produced for the year at 14.683c. per lb., against a cost for the previous year of 14.98c. per pound.

At the Blue Bell mine, 3112 ft. of diamond drilling was accomplished, at a cost of $9142.35, equal to $2.938 per ft. This exploration resulted in the discovery of three new orebodies, two of which have been opened and put on a producing basis. During the year, 4638.5 ft. of drifts, crosscuts, and raises were driven, at a cost of $67,874.62, equal to an average cost of $14.63 per ft. of advance. The entire cost of exploration and development amounted to $77,016.97. This was charged against the mining operations for the year and amounted to $0.5875 per ton of ore shipped. The new ore developed amounted to 69,290 tons, against which the actual cost of exploration and development amounted to $1.11 per ton.

The total reserve of ore, estimated as positive, highly probable, and probable, on Jan. 1, 1919, was 470,000 tons, of which 15,593 tons was broken in the stopes. The estimated reserves show a decrease of 66,800 tons during the last year, during which period 131,090 tons of ore was produced and shipped from the mine. The average grade of all ore included in this estimate is figured at $2.50 in gold and silver and 2.80% copper.

The Blue Bell mine made a record production of 131,090 tons of ore, an increase of 30% of the 1917 tonnage and containing on the average $1.26 in gold, $1.50 in silver, and 2.771% copper. The cost of producing ore at the Blue Bell amounted to $3.786 per ton of ore produced. This cost included all exploration and development, also sorting and freight transportation to Humboldt.

No diamond drilling was carried on at the De Soto mine, but exploration and development to the extent of 874½ ft. of advance were accomplished, at a cost of $16,949.61, equal to $19.39 per ft. of advance and $0.3954 per ton of ore produced.

The total reserve of positive, highly probable, and probable ore at the De Soto mine was estimated on Jan. 1, 1919, at 33,000 tons. A considerable portion of this reserve is comparatively low in grade, and the average value is figured at $2.30 in gold and silver, and 2.60% copper. At the De Soto mine as well as at the Blue Bell mine, the content in gold and silver has tended to increase during the last few years, whereas the copper content has gradually diminished. The production from the De Soto mine was a trifle less than in 1917, amounting to 42,870 tons, containing on the average $1.54 in gold, $1.20 in silver, 2.576% copper. At present the rate of production is approximately 100 tons per day. The cost of the De Soto ore, f.o.b. Humboldt, was $3.6857 per ton. The concentrator operated continuously throughout the year, and treated 104,633 tons of ore, or 1% less than in 1917. The average content of all material milled was $2.25 in gold and silver and 2.572% copper. The recoveries made in 1918 were: 89.52% copper, 67.16% gold, and 71.91% silver. The total cost of concentration was $1.9235 per ton, compared with $1.776 in 1917. The smeltery treated 160,328 tons of new metal-bearing material, an increase of 15% over the tonnage smelted in 1917. The recovery was 95.07% gold, 92.30% silver, and 93.82% copper. The total production of the smeltery was: 14,178 oz. gold, 442,809 oz. silver, and 18,800,073 lb. copper.

The production was derived as follows:

	Gold, Oz.	Silver, Oz.	Copper, Lb.
From domestic material (Blue Bell-De Soto ores and concentrates)	8,409	204,660	8,514,177
From custom material	5,769	238,149	10,285,896

The custom material was purchased from 67 shippers, and principally from the United Verde Extension Mining Co., the Arizona-Binghamton Copper Co., the Swansea Lease, Incorporated; Bradshaw Reduction Co., Jerome-Verde Copper Co., Swastika Development Co., and the Phelps Dodge Corporation (Copper Basin Branch). The United Verde Extension, which shipped monthly approximately 1,000,000 lb. of copper to the smeltery during the early part of the year, blew in its own smeltery at Verde during the month of June, and thereafter the most important source of the custom ore supply was cut off. However, the tonnage of custom material was maintained until almost the close of the year, although the copper content showed a great reduction, as it was necessary to substitute for the most part comparatively low-grade ores for the high-grade material which the United Verde Extension had shipped.

The cost of roasting and reverberatory smelting dropped from $4.20 in 1917 to $3.17 in 1918, a decrease of $1.03 per ton.

The net operating profit for 1918 is shown as $703,656.78, this figure being subject to adjustment, as a large amount of copper was carried unsold at the end of the year, and the actual sale price is still a matter of uncertainty.

The total production of domestic copper was 8,514,177 lb., a trifle in excess of the 1917 production. The domestic copper was produced at a total cost of $0.1468 per lb. and this figure is arrived at by crediting the value of the gold and silver produced and also the profit on custom material treated.

Ray Consolidated Copper Co.

The total ore mined in 1918 by the Ray Consolidated Copper Co. was 3,476,749 tons, containing 1.654% copper. Of the ore received at the mill, 3,426,600 tons was milling ore, and the remainder, 50,149 tons, averaging 4.46% copper, was sorted or selected ore that was sent to the smeltery for direct treatment. Mining cost was $1.76 per ton, including coarse crushing and loading. Total ore milled in 1918 was 3,411,000 tons, averaging 1.613% copper. A recovery of 74.92%, corresponding to 24.17 lb. per ton, was obtained. Cost of milling for the year was $1.01 per ton, compared with $0.83 in 1917. Production of copper from all sources was 86,919,270 lb., and the average cost per lb. was 17.695 cents.

The comparative statement is as follows:

COMPARATIVE STATEMENT, RAY CONSOLIDATED COPPER CO.

	1918	1917	1916
Operating revenue	$19,209,311.29	$21,278,070.90	$20,060,783.48
Operating expense	14,795,199.56	11,299,415.22	8,200,633.42
Net income	$4,414,111.73	9,978,655.68	$11,860,150.06
Other income	389,343.70	437,647.14	224,015.71
Total income	$4,803,455.43	$10,416,302.82	$12,084,165.77
Other charges	150,000.00	715,133.08	367,737.76
Net profit	$4,653,455.43	$9,701,169.74	$11,716,428.01
Dividends	$5,125,831.75	(a) 6,624,151.80	4 337,954.75

(a) Includes $788,589.50 capital distribution.

Nevada Consolidated Copper Co.

Net reserves of developed ore at the end of 1918 for the Nevada Consolidated Copper Co. totaled 68,549,644 tons, containing 1.57% copper. This figure does not include carbonate ore in storage, amounting 165,000 tons, nor the tonnages contained in the Kimberley, Wedge, and Veteran areas, which total about 1,000,000 tons. Sulphide ore mined from the pit and shipped to the concentrator during the year was 2,711,743 tons, of an average of 1.334% copper, and that from the Ruth mine was 1,316,144 tons, averaging 1.857% copper. In addition, 14,811 tons of siliceous carbonate ore, assaying 2.99% copper, was mined and shipped to the smeltery as a flux, and 5960 tons, assaying 2.84% copper, was shipped from stockpiles. There was also mined for the Consolidated Coppermines Co. 193,093 tons of sulphide concentrating ore, assaying 1.545% copper. During the year 2,617,771 cu.yd. of capping was removed by steam shovels. The total steam-shovel mining cost of concentrating ores was 41.69c. per ton, of which 15.81c. represents taxes, leaving 25.88c. as the operating cost. The total mining cost, including taxes and a stripping-suspense charge of 34.9c., was 76.62c., as against 63.38c. for 1917. Underground costs were $1.2855 per ton.

Total company tonnage milled was 3,999,526 tons, averaging 1.506% copper, actual mill extraction being 67.28%, ratio of concentration 8.22:1, and copper in concentrate 8.33%. Total milling costs were 93.1c. per ton, but this does not include depreciation of plant. In addition, the company milled 193,093 tons of sulphide ore, averaging 1.545% copper, for the Consolidated Coppermines Co. Four reverberatory furnaces operated throughout the year and a fifth furnace was placed in operation in August. Total charge smelted was 654,650 tons. Copper production during 1918 was 76,607,062 lb., at a total cost per lb. of 17.98c. In addition, 15,191,770 lb. of copper was produced from custom ores. The comparative statement of finances is as follows:

COMPARATIVE STATEMENT NEVADA CONSOLIDATED COPPER CO.

	1918	1917	1916
Operating revenue	$16,787,656.68	$20,279,722.71	$24,366,291.50
Operating expense	14,437,280.63	11,635,375.33	9,996,022.83
Net income	$2,350,376.05	$8,644,347.38	$14,370,268.67
Other income	1,051,694.48	1,293,251.29	1,065,090.47
Total income	$3,402,070.53	$9,937,598.67	$15,435,359.14
Dividends	$1,199,674.20	7,298,018.05	7,497,963.25

Homestake Mining Co.

The 1918 annual report of the Homestake Mining Co. shows that shortage of labor curtailed operations at the mine during the year, but the situation is now improving, and a return to normal conditions may be expected at an early date. Wolframite ore sufficient to keep the concentrating plant running continuously, at full capacity, was mined during the year. There remains in the mine a considerable tonnage of this ore of fair grade for concentrating.

Owing to excessive cost and scarcity of supplies, and particularly to shortage of labor, prospecting and development work in the mine on the scale heretofore in practice was cut down, although not entirely discontinued. The mine engineer reports 3661 ft. of development drifts, 1820 ft. of prospecting drifts, and 1873 ft. of development raises during the year. No shaft sinking was done.

Pertinent data as to mining and metallurgical operations are conspicuous by their absence from the report; but it is stated that the mine and surface plants are in good condition, with enough ore developed for many years' profitable operation.

Chino Copper Co.

A report covering the first quarter of 1919 has been issued to the stockholders of the Chino Copper Co., in which it is stated that the gross production of copper contained in the concentrates produced was 11,512,133 lb. The total amount of ore treated for the three months was 494,200 tons. The average copper content was 1.80%, and the ore was more favorable to concentration than that treated during the previous quarter. A total of 41,589 dry tons of concentrates, averaging 13.31%, was produced.

The financial results of the company's operations for the first quarter of 1919 were: Deficit from copper production, $218,255.04; miscellaneous income, including payments for precious metals, $44,813.17. Distribution to stockholders amounted to $652,485, leaving a net deficit of $825,926.87.

Curtailment of operations became necessary at the beginning of this quarter, owing to the large accumulation of unsold copper stocks and lack of orders. The report expresses the hope that operations can be continued at the present rate of about 50% capacity until a demand reappears for metal at prices that will afford a reasonable margin of profit. This will depend, it was stated, upon the extent of further accumulations of unsold copper and the carrying capacity of available resources.

Butte & Superior Mining Co.

The report of the Butte & Superior Mining Co. covering the first quarter of 1919, containing information respecting the principal operating features for the quarter, as compared with those for the fourth quarter of 1918, is as follows:

	First Quarter, 1919	Fourth Quarter, 1918
Dry tons of ore milled	71,298	110,039
Average zinc content, %	15.436	15.501
Average silver content, oz. per ton	6.710	6.515
Zinc concentrates produced, tons	19,307	30,391
Average zinc in concentrates, %	54.50	52.635
Total zinc in concentrates, lb.	21,044,540	31,994,804
Average silver in zinc concentrates, oz. per ton	22.012	21.047
Mill recovery (% zinc recovered in concentrates)	95.606	93.785
Direct mining cost, per ton	$6.4003	$7.948
Direct milling cost, per ton	$2.9967	$3.244
Total direct cost mining and milling, per ton	$9.397	$11.192
Indirect, or general, costs, per ton, exclusive of freight	$1.376	$0.6716
Total costs, per ton	$10.773	$11.864

The large decrease in the tonnage milled, as compared with the fourth quarter of 1918, was due principally to the curtailment of production on account of the general condition of the spelter market and the unsettled labor conditions during part of the month of February. Ore reserves were maintained at a slightly smaller tonnage than was shown at the end of the year.

The cost of mining was reduced to $6.40 per ton of ore, a decrease of about $1.55 per ton from that of the previous quarter. Indications point to further, though gradual, reduction of mining costs. The grade of ore mined and milled was approximately the same as that of the previous period.

The results of milling operations were still further improved, the recoveries of zinc being increased 1.82% and the grade of zinc concentrates improved to the extent of 1.86%. It is probable that the metallurgical results obtained for this quarter are approximately what may be expected for future operations. The cost of milling, despite the large reduction in tonnage handled, was reduced somewhat below that of the previous quarter, so that the total cost of mining and milling is $1.79 less than for the previous period, exclusive of indirect or general charges.

Financial results of operations for the first quarter, as compared with the previous period, are as follows:

	First Quarter, 1919	Fourth Quarter, 1918
Net value zinc concentrates at mill	$382,156.11	$983,362.32
Net value lead concentrates at mill and residues	250,336.85	398,352.34
Miscellaneous	19,193.61	20,262.53
Totals	$651,686.57	$1,401,977.19
Operating costs, taxes and other charges	768,065.42	1,305,470.56
Profits	$116,378.85 (a)	$96,506.63

(a) Loss.

The above statement of costs includes depreciation and expenses incurred during the strike in February, but no allowances have been made for depletion. The average price of spelter used for estimating the profits for the respective quarters was 6.189 cents.

Inspiration Consolidated Copper Co.

The Inspiration Consolidated Copper Co. reports that income from sales of copper during 1918 amounted to $17,516,323.05. The following expenses were incurred: Mining, including development, $3,743,032.25; reduction, including transportation of ore, $4,673,142.91; refining and selling, including transportation of metals, $2,323,403.59; administration and Federal corporation taxes, $1,065,743.07—a total of $11,805,321.82. Copper on hand Dec. 31, 1918, was valued at $2,978,099.43, and this amount, added to the income from sales of copper and deducting expenses, gives a balance of $8,689,100.66. Charging off a depreciation amount of $750,000, and crediting $290,062.94 for other investments, gives a balance of $8,299,163.60. Dividends amounting to $9,455,736 were paid, which leaves a balance of $12,784,432.71 as of Dec. 31, 1918.

During 1918, a total of 5,110,101 tons of concentrating and 29,031 tons of siliceous oxide ore were mined. No development work for the purpose of increasing ore reserves was performed during the year. Average output of ore per man-shift for all labor chargeable to the mining department was 21.5 tons. A total of 14.88 miles of underground openings was driven. The concentrator operated an average of 15 sections during the year, the yield of copper from concentrating ores being 19.08 lb. per ton.

The following additions were made to mine and surface equipment: Installation of an underground ventilating system; automatic block-signal installation on underground haulage system; installation of air-driven mucking machine; enlargement of changehouse; purchase of railroad equipment for the transportation of employees, and an addition to the power plant of four 713 hp. Sterling boilers, which installation, at the end of the year, was 75% complete.

Quincy Mining Co.

The copper-rock output of the Quincy Mining Co. during 1918 was 1,174,147 tons, from which was produced 31,970,969 lb. of mineral, yielding 19,948,965 lb. of refined copper, or 16.99 lb. per ton of rock. Total expenses, including mining, development, taxes, smelting, and transportation charges, were $3,733,133.25. Metal sales totaled $4,857,085.15 and other income was $81,475.02. Deducting $342,382.52 for construction at the mine and smeltery and for accident account, there remains a business income of $863,044.40. Dividends of $935,000 were paid.

Development totaled 24,580 ft. Shaft operations at No. 2 shaft, which is being sunk to the 80th level, progressed 115 ft.; No. 6 shaft was sunk 125 ft. and No. 8 shaft, 187 ft. Among the changes and improvements during the year were the following: A power scraper for underground work was perfected and an underground power shovel was successfully used. Four storage-battery locomotives were added to the underground tramming equipment. A new hoisting-engine house was practically completed at the end of the year. Additions were made at No. 1 and No. 2 mills, and provisions made for the installation of five 8-ft. Marcy ball mills and 240 additional tables. Fifty dwelling houses at the mine and six at the stamp mills were completed. An investigation was made as to the quantity of silver that could be recovered from mineral at the stamp mills, and this work yielded 13,982 oz. of 80% silver and 20,800 oz. of silver between 12 and 20% pure.

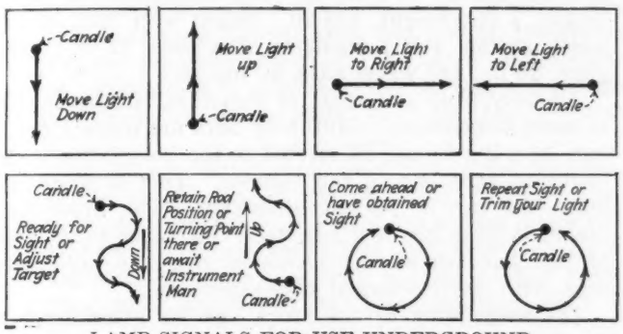
French Export Restrictions have been relaxed in a decree signed by the President of France on May 13, according to *Commerce Reports*. The number of classes of goods for which French export licenses are required is reduced from 111, as provided in the decree of Jan. 20, to only 19. The list includes the following minerals and metals: Phosphates of lime, bauxite, coal and coke, crude gold, platinum, and silver, iron ore, and metallic money.

Details of Practical Mining

Mine Surveyor's Lamp Signals

By Roy H. Poston*

In underground surveying, the various noises that are inherent to mining often make it impossible for spoken directions and signals to be understood between the mine engineer and his helpers, so that it is necessary to resort to some other manner of communication, and this is

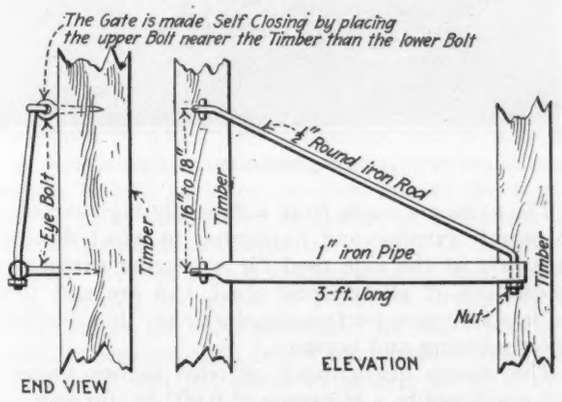


LAMP SIGNALS FOR USE UNDERGROUND

usually done by means of lamps or candles. The sketch illustrates a few of the signals that are used in connection with a system adopted by one of the mining companies in Southeastern Missouri. Blueprints showing a complete set of such signals are prepared for the mine surveyor and his helpers, and they are expected to familiarize themselves with their use.

Self-Closing Manway Gate

A safety guard for manways that closes automatically and eliminates the danger of a passageway being left unguarded is shown in the sketch and is described in the Mar. 22 issue of *Ax-i-dent-Ax*, the safety publication of the U. S. Smelting, Refining and Mining Company.



TYPE OF SAFETY GATE AT MAMMOTH MINE

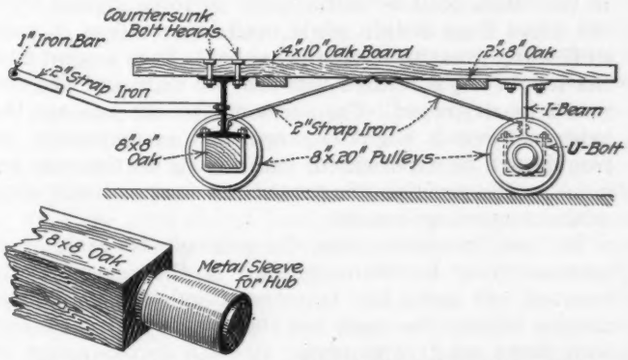
The principle upon which the gate operates is not new, for it can be seen wherever garden gates are used, and consists of an arrangement of the hinges which insures the gate closing each time after being opened. Construction of the gate requires only one piece of 1-in. pipe, 3 ft. long; one piece of ½-in. round iron 3 ft. 6 in. long, and two pieces of ½-in. round iron 6 in. long (for I-bolts). At most mines these materials may be found in the scrap pile, and as any blacksmith can do the necessary work in half an hour or less, the cost is trifling. The gates are light, and anyone who can drive a nail can install them. When the stope is worked out, and they are no longer needed at one point, the gates can be easily taken down and used elsewhere.

Those in use at the Mammoth mine, at Kennett, Calif., are made to a standard size of 3 ft., but, owing to their extreme lightness, they could be made longer to guard a wider opening without being less effective.

*St. Francois, Missouri.

A Home-Made Shop Wagon

The shop wagon shown in the accompanying sketch was built entirely of discarded materials, the only cost



SHOP WAGON MADE FROM DISCARDED MATERIALS

being that of the labor. The contrivance has been in continual use for six years, and, except for the need of an occasional nut or bolt, has required no attention.

Automatic Car-Dumping Device

By L. H. Goodwin*

An automatic car-dumping device, shown in the illustration, was used on a 4-ton wooden ore car in connection with a small and somewhat makeshift installation. Other designs might have been found more suitable to manufactured types of cars, but in the above instance I found that the use of this appliance answered all the requirements of dumping the car at the proper time and place. The car was used to lower ore from a bin at the top of an incline to another bin at the bottom. An attendant at the upper bin hoisted the empty car, loaded it from the chutes, and then lowered the load to the bin below, where the car dumped automatically. After hoisting, the attendant closed the doors and adjusted the dumping device before loading.

The car was provided with a V-bottom, and the doors were hinged at the top so that they would swing outward when dumping. Steel rods of 1-in. drill steel were held across both doors by means of straps so placed

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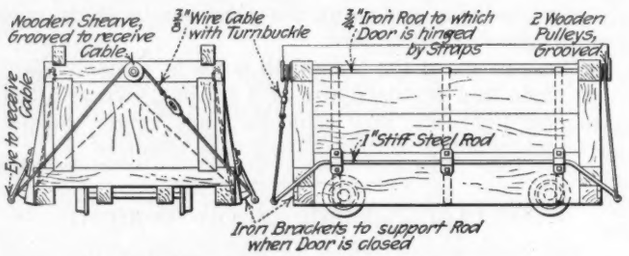
that the rods would rotate freely. These rods protruded about 2 ft. at either end beyond the doors, and were bent downward and outward at this point, the ends being provided with eyes. The projecting rods at either end of the car were connected by means of a ⅜-in. cable that passed over a small wooden sheave at the top of the car. Turnbuckles were placed on the cables, and it was possible to adjust them as required and secure the proper length as the cables stretched.

In the sketch, the doors are shown in the closed position. When the car is filled, the force exerted by the pressure of the ore against the sides is transmitted along the projecting rods or arms and is communicated to the cable, which becomes taut. It will be seen that


Wooden Sheave, Grooved to receive Cable
⅜" Wire Cable with Turnbuckle
¾" Iron Rod to which Door is hinged by Straps
2 Wooden Pulleys, Grooved
Eye to receive Cable
1" Stiff Steel Rod
Iron Brackets to support Rod when Door is closed

AN AUTOMATIC CAR-DUMPING DEVICE

in the closed position of the arms no force applied upon the doors from within could open them unless it were sufficiently great to stretch the cable to such a point that the toggle angle formed between the door and the rod would be destroyed. The force of the ore against the sides has only a slight leverage, and, consequently, no trouble will be experienced, and as long as the rods remain in the position illustrated the doors cannot open unless something breaks.

To free the doors from the grip of the cable it is necessary only to rotate one pair of the arms slightly outward. In doing this the other toggle angle, namely, the one between the cable and the arm, is destroyed, and both doors are free to open. A small force applied to the end of the arm is sufficient to move it outward, because it possesses the advantage of a 2-ft. lever. It is evident that with a 4-ton load in the car the pressure against its sides will be considerable, and that the cable will have sufficient force applied to it to keep it tight and without slack. Granting this, it is again evident that when the arm is rotated, even though its arc of rotation is slight, the cable must be lengthened ever so little. With the advantage of the lever, however, this tiny stretch in the cable is easily made, and the force required to trip the arm is slight.

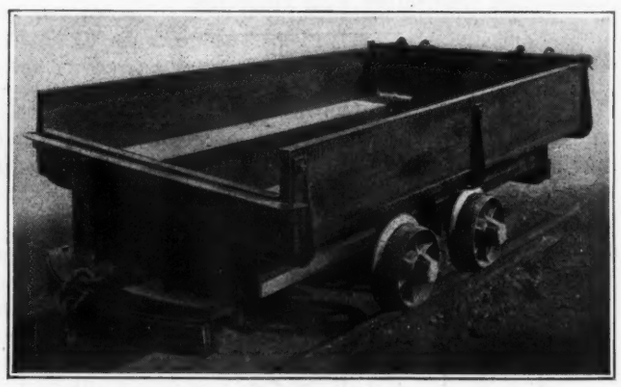
The arm is tripped at the unloading point by means of a steel shoe placed at such a point that it will engage one of the arms at the front of the car at the moment when the car is in the proper position for dumping. This shoe is given sufficient slope so that its contact with the arm causes rotation of the latter, thus freeing the doors. Once the doors are released, the pressure of the ore causes them to open, and the car empties itself easily. Points which need especial attention may be noted as follows: The slope of the V-bottom should be sufficiently steep to give the ore a good momentum when it leaves the car, otherwise it will not dump clean; a steel bottom aids greatly in securing that result. Much depends upon the steel rods, as they are subjected to considerable strain. Doors should be hung on a slight batter, so that they will close more easily. They must be strong, as they have little support at the bottom. Sufficient room should be left at the dumping point to assure that the ore, as it leaves the car, is not impeded in its passage. The track must be kept clear of obstructions which might act as trippers and prematurely dump the car. The idea was obtained from an old and discarded coal-handling and stacking plant, in which apparently several cars had been operated on one cable and dumped in this manner.

New Type of Mine Car

A type of mine car, recently produced by the Anniston Steel Co., Anniston, Ala., for one of the Alabama coal companies, is illustrated in the accompanying sketch. The design embodies several novel features which will be found applicable in the mining field. Specifications for this car are as follows: Capacity, 2000 lb.; inside length, 7 ft.; height, 18½ in.; height over rail, 30 in.; width at top, 4 ft.; diameter of wheels, 12 in.; track gage, 36 in., and wheel base, 20 inches.

All body irons are made of structural shapes formed to exact dimensions. Stiffening bars are made from Z-bar, 1¾ x 2 x 1½ in., all riveted to the body binders and bolted at each end to the bumper. This arrangement holds the car in perfect alignment. The draw bars are made from 2 x 3½ x ⅜-in. tees. Attached to the ends of this bar are electric cast-steel drawbar hooks and eyes, with electric-forged steel hitchings.

The assembling of the truck and its attachment to the bottom of the car are done by means of 3 x 3 x ⅜-in. angles or 10-in. 15-lb. channels, as required, all riveted to the body irons as well as to the draw bar and the stiffening Z-bar. The wheels are provided with ⅜-in. pipe plug for oiling purposes. The axle housings are bolted through the channels or angles, passing through the entire bottoms and inside washer plates.



SPECIALLY DESIGNED MINE CAR

The axles are made from sufficiently high-carbon steel to permit turning and hardening to exact dimensions that part of the axle used for a bearing surface. The wheels are of electric cast steel, and are cast in steel chillers to insure perfect concentricity, thus facilitating the machining and boring.

The wheels are greased or oiled before assembling and are bored to a tolerance of 0.002 in. for application of the Hyatt shock-absorber roller bearing. The housings are also electric steel castings, designed especially to prevent dust and other disintegrating substances from entering the bearings, and are well packed with felt to accomplish this purpose.

The oak used in the manufacture of the cars is selected stock of the best grade obtainable.

Ore Dressing and Metallurgy

The precise action of commonly used materials is likely to be ignored, and the notes on the use of lime will draw attention to an important phase of metallurgical work. The electrical explanation as to the settlement of a ground ore by an electrolyte such as lime may not be generally acceptable, as it is now known that other coagulation phenomena, dependent on adsorption of the metallic ion of the electrolyte, take place when the particles are all of the same electric sign, and should, therefore, remain mutually repulsed. No final explanation of coagulation is available, but further discussion will help to throw more light on the subject.

Preliminary testing work may lead to the adoption of the proper process and the most efficient equipment, but control of operations is always simplified and results are almost invariably improved by a continuance of experimental checking. The flotation flask described has been designed with a view to insuring accurate forecasting, and will prove a most useful adjunct in the laboratory.

Lime as a Settling Agent

BY PAUL T. BRUHL*

Lime is so common a reagent in cyanide practice that one is, in general, more content to tacitly acknowledge its beneficial effects than to attempt any explanation of the way in which it functions. To admit that lime is useful because it counteracts any acidity in the ore and promotes settlement is, of course, merely a statement of fact. To explain "why" a certain effect takes place is usually easier than to explain "how" it takes place. For instance, it is known that lime aids settlement by causing coagulation of the slimes. This statement, however, gives no information as to how the effect is produced. If it be possible to learn exactly how it is that lime functions, it will become practicable to control its use in the most economical way. The proper settlement of slime is of importance in cyanide mills where decantation is practiced, and it would be helpful to discover the causes to which poor settlement may be attributed.

A dirty overflow, as poor settlement is sometimes described in mill parlance, is often due to the fact that pulp is being sent to the thickener in quantities in excess of the machine's capacity. It may be caused when the pulp is of too high a specific gravity, and, therefore, of a viscosity too great to permit a sufficiently rapid settlement of the solid particles. As the viscosity of a solution increases with fall of temperature, the solids in a cold pulp will not settle as quickly as in a warmer one. Time of settling depends also on the physical condition of the slime, for as it becomes finer the influence of gravity becomes less and less, and surficial forces between solids and solution have a correspondingly greater effect, owing to the increase of internal surface. When the slime is in the colloidal form settling may become economically impossible. I remember a run-of-mine ore which settled well when the protective alkalinity was maintained at 1 lb. per ton. The ore, however, that was obtained from a certain section of the mine was clayey in character, causing the thickener overflow to become dirty. Even at a short distance the overflow looked clear, but floccules of gelatinous material could be distinguished on closer examination. These soon choked the pores of the cloths in the clarifying filter, necessitating frequent treatment with hydrochloric acid. The protective alkalinity was varied from 0.5 to 3 lb. per ton without improvement. It is probable that the floccules consisted in large part of a precipitate formed by chemical action between some constituent of the ore and calcium hydrate.

It is regarded as probable that quartz particles acquire charges of negative electricity on their surfaces and that these similar charges cause the particles to repel one another and thereby hinder settling. The lime dissolves with the production of positive ions in excess, which neutralize the negative charges borne on the surfaces of the quartz particles, and so deprive them of their capacity for mutual repulsion. I have noticed, however, that some ore slime will settle more readily in a solution that carries undissolved slaked lime than in one that has all the lime in solution, and, temporarily, a higher protective alkalinity. This observation indicates that the solid slaked lime possesses a property that enables it to effect a more rapid settlement than the same quantity of lime in solution. What is this property?

In metallurgical practice it is the aim to use the smallest quantity of lime that will insure sufficiently quick settling. It may well be, then, when small amounts of lime are used, that the negative charges of the quartz particles are not all neutralized, but that some of the particles are discharged, and that these, by reason of collisions with other particles that are still charged, again acquire negative charges (which are naturally weaker than the original ones), and so, as a whole, the system becomes less intensely electrified, and the force of repulsion becomes too weak to hinder settlement. It is possible that the more rapid subsidence of the slime observed when some undissolved slaked lime is present is due to the lime particles carrying larger charges of positive electricity. Lime when used in too great an excess may retard settlement, because, though the charges on the quartz particles are neutralized, so much positive electricity is present that the quartz now acquires a positive charge, and subsidence of the slimes is again impeded.

Lime is added either in crude form directly to the ore, or the addition is made after slaking. The latter method is undoubtedly preferable, because slaked lime is about 30% more soluble than unslaked lime, and it produces a more marked settling effect. Some chemical reaction other than that represented by the recognized equation—$CaO + H_2O = Ca(OH)_2$—is probable; otherwise this difference is hard to explain. Oxygen in excess and water at a minimum must cause a change that does not occur, at any rate so markedly, when the lime is put in a large bulk of solution.

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From the considerations mentioned it would appear that the best results are obtained when lime is added continuously, as slaked lime, preferably in the form of a spray at or just below the surface of the solution in the thickener.

Experimental Flotation Flask*

By Will H. Coghill†

In flotation experiments it is desirable to have a hand device correlating successively with the experimental and commercial machines. This phase of flotation has not been sufficiently developed. I purpose describing a device which is intended to fill this gap.

Success in designing a machine depends upon the priciples selected to govern its detail. The principles that are applicable in the selection of this device are that the pulp density and the ratio of solids to frothing surface must be the same as in well-designed machines. The importance of these factors can best be emphasized by quoting from Del Mar.[1]:

> Under manipulation may be included the shape or form of the collecting chamber of the flotation machine, for the cells in any flotation system are used for two purposes, either to float a dirty concentrate, which must be cleaned before marketing, or to float a finished concentrate, which is ready for shipment. In the former case the collecting chamber of the machine should favor a quick discharge; that is, there should be a narrow chamber, but when we require the finished product the box must be sufficiently wide to allow the settlement of occluded waste or gangue. Manufacturers of flotation machines miss this point, and therefore the same machine is often used for roughing and for cleaning, although the two operations require entirely different manipulation. This important structural feature in the flotation chamber may make the difference between success and failure, for not only must a concentrate be produced, but it must attain a certain grade of metallic content to be fit for shipment.

On observing successful laboratory flotation machines of the mechanical agitation type, it is found that, when the pulp density is 3 to 1, there is from 30 to 60 gm. of ore for every square inch of frothing surface. Take a test tube of such a diameter that it gives a frothing area of 0.6 sq.in. The quantity of ore required is, then, say, 30 gm., and for a 3 to 1 pulp, 90 c.c. of water must be added. But the ordinary test tube of this diameter will hold only 85 c.c. of water and is 8 in. long. After making allowances for the volume of ore and air, the test tube would have to be about one foot long.

It is obvious that the adoption of these proportions in such a device would not be consistent. A loaded bubble which chanced to be at the bottom of the tube at the end of the agitation period would have to travel upward a distance of nearly twelve inches against a falling column of solids before it could deliver its burden to the froth. Needless to say, it would be wrecked at the outset and buried beneath the column of ore. Moreover, the test tube has no facilities for discharging the froth.[2]

The device which is recommended here has been used at the Northwest station of the U. S. Bureau of Mines at Seattle. It consists of two Pyrox flasks, one of 250-c.c. and the other of 500-c.c. capacity. A rubber nipple is placed on the neck of the smaller one, so that when the flaring portion is ground off it will fit snugly into the larger, as shown in the cut. To prepare a test, the smaller flask is filled with a mixture of ore and water of the desired consistence and emptied into the larger one, after which about 3 c.c. of water is added. After the desired flotation reagents have been added, a stopper is placed in the flask and the experimenter is ready to proceed with the test. The procedure of testing is by means of hand agitation for, say, five minutes. The stopper is removed, the flasks are united, and, after a brief agitation, placed in the position as shown. The extra 3 c.c. of water referred to elevates the lower level of the froth so that it will overflow into a collecting pan when the larger flask is removed. The agitation may be repeated as often as desired by adding a little extra water each time.

The efficiency, of course, is low as compared with the mechanical devices, but the relative floatability of minerals and relative effects of flotation reagents may be quickly determined. There are two reasons why the efficiency is low—there is no opportunity for the froth to build up during the agitation period, and a small quantity of gangue lodges on the bench formed by the union of the inner and outer tubes, and by joining the overflow reduces the grade of the concentrate.

HAND DEVICE FOR FLOTATION EXPERIMENTS

The quantity of modifying reagents must be determined by calibrated devices. Otherwise impressions may be misleading, and deductions which are unwarranted might be made. This is demonstrated by the following example: When four drops of oil was added from a medicine dropper, the pyrite floated so freely that the results were adverse. The dropper was then calibrated and it was found that 4 lb. of oil per ton of ore had been used. The test was then repeated with one drop of oil, and the results were encouraging.

This device then has three points of advantage over the test tube: It has convenient discharging facilities, and it provides for desirable pulp densities and a constant area of frothing surface.

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*Published by permission of the Director of the Bureau of Mines.

†Metallurgist of the Bureau of Mines.

[1]Del Mar, Algernon, "Differential Flotation of Lead and Zinc Sulphides," *Min. and Sci. Press*, Vol. 117, Nov. 25, 1918, p. 692.

[2]The separatory funnel which has been recommended by "A Special Correspondent," *Min. and Sci. Press*, July 24, 1915, p. 122, and by Ralston, O. C., and Allen, Glenn L., *Min. and Sci. Press*. Jan. 8, 1916, p. 44, is faulty because the proportions are not good and the froth has to stand until the tailing is removed.

The Engineering Standards Association

The establishment of the American Engineering Standards Association is the development of a constructive principle of broad purpose, and through coöperation of technical societies and Government departments it is possible to unify standardization work which, if carried out by various organizations operating independently, has a tendenccy to produce diversification, rather than an effective coördination of industrial practice. Standardization will not only stabilize conditions governing commercial and technical matters, but it will also prevent duplications and waste motion and an overlapping of effort.

THE importance of standardization in many lines of engineering was emphasized by the war, and the work that has been done in that field shows clearly the need of coöperation, to prevent the confusion caused by the promulgation of overlapping standards by independent bodies. During the war the Government departments coördinated these efforts in certain lines and greatly assisted in unifying them.

The American Institute of Mining and Metallurgical Engineers, the American Institute of Electrical Engineers, the American Society of Civil Engineers, the American Society of Mechanical Engineers, and the American Society for Testing Materials, recognizing the value of what had been done, invited the Government departments of War, Navy, and Commerce to appoint representatives to collaborate with them in continuing this work. The body so formed is known as the American Engineering Standards Committee. Considerable time has been required definitely to formulate its objects, and arrange methods for accomplishing them that would be effective without in any way interfering with the many organizations that have been doing such excellent work in the accomplishment of this object.

This committee has just completed and adopted a revision of its constitution, which has been sent to the governing boards of all the departments and societies represented on the committee, with a request for its ratification. The new constitution changes the name to American Engineering Standards Association, the change from "committee" to "association" more fittingly indicating the wide scope of the interests involved.

Purposes of the Standards Association

The objects of the association are stated as follows: To unify and simplify the methods of arriving at engineering standards; to secure coöperation between various organizations and to prevent duplication of standardization work; to promulgate rules for the development and adoption of standards; to receive and decide on recommendations for standards submitted as provided in the rules of procedure, but not to initiate, define, or develop the details of any particular standard; to act as a means of intercommunication between organizations and individuals interested in the problems of standardization; to give an international status to approved American engineering standards; and to cooperate with similar organizations in other countries, and thus promote international standardization.

Means are provided for increasing the number of representatives in the association by invitation or upon request. Several important organizations interested in standardization will be invited to appoint representatives as soon as the necessary power is obtained.

The routine work of the association will be conducted by its secretary, under the direction of a board of directors. This board will have power to deal with all of the affairs of the association except the final approval of the standards submitted to it.

Conditions Governing Formation of Sponsor Societies

Any organization may request the association to approve standards which it has formulated, or to approve committees that it has appointed, and by so doing becomes a sponsor society. Such a request is entirely at the option of the organization that has formulated or expects to formulate the standard. At the request of the sponsor, approval of the standards is given when they are the substantially unanimous conclusions of a committee made up as follows: (a) Sectional committees dealing with standards of a commercial character (specifications, shop practices, and similar matters), shall be made up of representatives of producers, consumers, and general interests, no one of these interests to form a majority. A producer is a person, or the representative of a firm or corporation, directly concerned in the production of the commodity involved. A consumer is a person, or the representative of a firm or corporation, that uses the commodity involved, but is not directly concerned with its production. General interests include independent engineers, educators, and persons who are neither consumers nor producers, as defined above. (b) Sectional committees dealing with standards of a scientific or non-commercial character shall consist of persons specially qualified, without regard to their affiliations.

It is anticipated that in nearly all cases the approval of standards and committees by the association will be requested. If considered advisable, the association is authorized to call a meeting of those who would be interested in the formulation of a new standard or the revision of an old one, to select one or more sponsor societies. The sponsor society or societies will appoint a sectional committee to formulate or revise the standard. This sectional committee will report to the sponsor when its work is completed. The sponsor may then request the association to approve. The association deals only with the sponsor and acts only at its request.

Provision is made in all publications that a standard must be referred to as that of the sponsor, using whatever title the sponsor has given it, followed by the statement "approved by the American Engineering Standards Association." The approval may be given in one of three ways, either as recommended practice, tentative standard, or standard, the expectation being that nothing will be approved as standard until it has been shown that it is generally acceptable.

The association thus acts only to bring together those interested in a common object, and, when they have completed their work, will at their request certify that it has been done in such a manner as to justify its adoption. Nothing revolutionary is proposed; it is

merely an extension of present practice. The executive committee of the American Society for Testing Materials now passes on the composition of committees, ascertains that their conclusions are substantially unanimous, and, if so, reports them to the society for acceptance or rejection. The association does the same for groups of organizations. Its board of directors performs the same functions as the executive committee of the American Society for Testing Materials, and the association as a whole accepts or rejects. It neither selects sponsors nor sectional committees; it does not consider the subject matter of a standard, nor the procedure under which it is arrived at, except that it requires sufficient information from the sponsor to show that the conclusions are substantially unanimous and that the sectional committee is balanced and representative. It requires that in all publications the sponsor shall be given full credit.

In addition to the work of assisting in the selection of committees and certifying that their work has been done under proper conditions, the association will act as a bureau of information regarding standardization. It will collect information regarding existing standards and as to the bodies that have formulated and adopted them, and furnish information desired by the working committees regarding what has been or is being done on similar or related lines. It will establish relations with similar bodies in other countries and can do much to promote the acceptance of international standards.

Effective Means Devised for the Adoption of Standards

It is the unanimous conclusion of all those who have been consulted who have been active in standardization work that such an organization is urgently needed. Two or more organizations have on many occasions formulated standards for substantially the same thing, and though often these differences have been slight, neither has been entirely acceptable to the other interested person, firm, or organization. In the majority of such cases, if the organizations had been brought together at the beginning they could have agreed on a standard that would have been satisfactory to both.

The American Engineering Standards Association will furnish a means by which any organization intending to define a standard can readily ascertain what others are interested and should be consulted in regard to it. At present there is no such means. There is nowhere anything approaching a complete list of the organizations doing standardization work, much less any list of the standards proposed or in preparation.

The advantage of having any standard generally accepted, and the much greater probability of accomplishing this if it is prepared under definite conditions that have proved effective in the past, will, it is believed, cause most of the organizations engaged in such work to ask and receive the assistance of the American Engineering Standards Association. It provides definite machinery for securing coöperation and preventing duplication of work. It establishes definite rules to secure the absolute autonomy of any group engaged in the development of standards, and insures that this group shall receive full credit for its work.

With the assurances of coöperation that the American Engineering Standards Association has already received, it is believed that there is no question of the advisability of forming the more broadly representative association. Several organizations have already presented requests for the approval of existing standards, and many others only await the notification of the committee that it is fully organized.

Monthly Copper Production for 1919

The table which appears herewith is compiled from reports received from the respective companies (except in the cases noted as estimated), together with the reports of the U. S. Department of Commerce as to imported material, and in the main represents the crude-copper content of blister copper, in pounds.

MONTHLY CRUDE-COPPER PRODUCTION, 1919

	February	March	April	May
Alaska shipments (c)	5,176,033	1,471,398	2,153,691	.....
Arizona:				
Arizona Copper	3,360,000	2,800,000	2,400,000	2,400,000
Calumet & Arizona	6,612,000	4,602,000	3,822,000	4,308,000
Cons. Ariz. Smelting	1,000,000	720,000	770,000	690,000
Inspiration	6,600,000	6,700,000	6,900,000	6,200,000
Magma	1,211,175	1,000,212	674,943	.....
Miami	4,462,578	4,551,115	4,489,748	4,989,580
New Cornelia (a)	2,014,000	1,980,000	2,000,000	1,408,000
Old Dominion	2,360,000	2,574,000	2,389,000	2,564,000
Phelps Dodge	7,410,000	6,434,000	6,560,176	6,783,900
Ray	4,150,000	3,792,000	3,650,000	3,975,000
Shattuck Arizona	376,166	2,452	*Nil*	.....
United Verde	2,850,000	*Nil*	*Nil*	1,250,000
United Verde Extension	1,239,120	*Nil*	*Nil*	*Nil*
California:				
Mammoth	1,506,000	1,475,000	1,386,000	620,000
Michigan:				
Calumet & Hecla	9,263,868	9,652,053	8,554,113	6,796,819
Other Lake Superior (b)	6,500,000	6,500,000	6,500,000	6,500,000
Montana:				
Anaconda	12,400,000	13,900,000	13,750,000	13,500,000
East Butte	633,560	1,700,230	1,347,580	1,414,460
Nevada:				
Mason Valley	947,336	*Nil*	*Nil*	*Nil*
Nevada Cons	4,150,000	3,650,000	3,763,000	3,700,000
New Mexico:				
Chino	3,552,676	3,770,000	3,498,747	3,583,396
Utah:				
Utah Copper	10,335,000	8,366,000	9,420,000	9,125,000
Eastern smelters (b)	1,400,000	1,400,000	1,400,000	1,400,000
Total reported	99,509,512	87,040,460	85,428,998	.....
Others, estimated	12,140,000	15,000,000	13,380,000	.....
Total United States	111,649,512	102,040,460	98,808,998	.....
Imports: Ore and concentrates, etc	13,824,200	10,146,979	9,773,655	.....
Imports in blister, etc	33,369,626	49,564,536	22,781,489	.....
Grand total	158,843,338	161,751,975	131,364,142	.....
British Columbia:				
Granby Cons	2,610,737	667,142	707,301	1,267,668
Mexico:				
Boleo	1,807,680	2,039,520	1,433,040	.....
Cananea	3,000,000	3,200,000	3,000,000	3,000,000
Phelps Dodge, Mexican properties	1,775,000	1,900,000	1,702,000	1,552,000
Other foreign:				
Cerro de Pasco	4,586,000	4,838,000	4,780,000	4,034,000
Chile	5,376,000	4,568,000	5,024,000	5,066,000
Katanga	3,877,890	3,262,800	.....	.....
Backus & Johnston	1,642,898	2,144,825	.....	.....

(a) Only electrolytic cathodes are entered. New Cornelia also produces some copper from ores sent to Calumet & Arizona smeltery. (b) Estimated. (c) Official figures of the U. S. Department of Commerce; includes Kennecott production from its Alaska mines.

Production of the United States by months since the beginning of the year and the corresponding figures for 1918 were as follows:

	1918	1919
January	165,431,568	135,733,511
February	160,011,364	111,649,512
March	185,525,168	102,040,460
April	163,207,096	98,808,998

The grand total includes, under "Imports in ore and blister copper," the production of such companies as Granby, Cananea, Braden, Cerro de Pasco, and Chile. As a matter of record, however, the individual figures are given after the total. We also report the copper output of the Boleo and Katanga companies, which does not come to the United States.

British Export Regulations.—A cable dispatch from the Consul General at London announces that a proclamation of May 10, 1919, grants a general export license for certain commodities, among which are the following: Iron billets, blooms and slabs; iron ore; iron sheet and bars; steel billets, blooms and slabs; steel ingots; steel sheet and bars.

Industrial News from Washington

BY PAUL WOOTON, SPECIAL CORRESPONDENT

New Potash Bill Considered

The domestic potash industry has not found an enthusiastic friend in the Ways and Means Committee of the House of Representatives. This became evident during the hearings on the bill introduced by the chairman of the committee, Representative Fordney, of Michigan. Mr. Fordney's bill contains the licensing plan which was in the bill that was reported favorably by the Senate Committee on Mines and Mining at the last session of Congress.

The bill as it came from the committee on that occasion has been reintroduced in the Senate by Senator Henderson. The Fordney bill contains, in addition, a provision for a duty of 10c. per unit of potassium oxide, effective five years after the proclamation of peace. The licensing powers terminate at that time.

The potash producers have made practically the same case in this hearing as was presented by them before the Senate committee at the last session. They are able at this time, however, to bolster their claim by evidence that the German and Alsatian interests already are busily soliciting orders in this country. The expert testimony also is much the same, but many minor points of interest which are new are brought out.

The hearing was opened by George Otis Smith, Director of the U. S. Geological Survey. He was questioned at length by members of the committee. Among the references to the Alsatian deposits, Dr. Smith said:

> Seven mines are now in operation, and several other mines are being put into operating condition. Able technical talent has been secured and excellent progress made in restoring these properties. The mines compare fairly well in size and equipment with the best German mines. The daily production is about 2300 tons of potash salts, averaging about 20% of actual potash—that is, about 460 tons K_2O, in terms which I have used for the United States product. That would represent about 150,000 tons K_2O per year, or three times our own production last year. They have stocks on hand there which in April were at least 8000 tons of actual potash. February quotations for domestic consumption, delivered at Rotterdam, was about 60c. per unit of potash, a unit being 1% of a ton, or 20 lb. K_2O. Export prices have not been established, so far as Mr. Gale could learn. The shipping cost from Mulhausen to Rotterdam is given by him at about $2.50 a ton.

The producers' position, as stated to the committee, is that they prefer a tariff bill with a duty on potash, but they fear the President would veto such a measure. They are of the opinion, however, that he would not veto a licensing bill. Representative Kitchin, the ranking minority member of the committee, stated during the hearing that he assumes the President would sign any bill that would be in the interest of the American people, whether in the form of a tariff or a license. Representative Garner rather chided the producers for trying to get protection by indirect methods. The spokesman for the producers hurried to point out that no effort was being made to mislead anyone, but that a licensing bill will reduce the expense to the farmers by $10,000,000, assuming that a tariff would take $20,000,000 to protect the industry. The producers also made formal denial that there had been any combination among them to hold up the price of potash.

The producers lost no opportunity to impress upon the committee the necessity of prompt action. They pointed out that 90% of all potash used in this country goes into fertilizer and that 75% of the fertilizer is manufactured by six large concerns with abundant capital and highly efficient organizations. Under such conditions, it was argued that importations could be made quickly, once the bars are down. It was argued on the other hand, however, that the stories of a great German surplus are mythical and that quantity production in Alsace is a matter of years. It was also stated that pre-war prices on imported potash never again will prevail. The opinion was expressed that the price of German potash under present conditions would not be less $1.25 per unit when laid down at our Atlantic ports.

The argument on the other side of the question is that domestic producers have enjoyed four years of absolute embargo and a price six times the normal. If they have been unable, under those conditions, to establish an industry, two or three years more hardly would affect the result. The opinion was expressed that the low-cost and properly capitalized producers can compete with foreign potash at present, whereas only prohibitive protection would be of assistance to high-cost producers.

The United States Tariff Commission in a formal statement to the committee declared that potash presents one of the most complex tariff problems in the tariff schedule. No recommendation is made, however, but the commission presents "some of the facts likely to be most significant in determining the fate of the new industry." The situation before the war is reviewed. The significance of potash in agriculture and in the chemical industries is pointed out. The development of the industry in the United States from the beginning of the war to the signing of the armistice is outlined. The development in other countries is referred to briefly and detailed information is given concerning the individual salts. That the peace treaty may have a large influence on the potash situation is pointed out by the Tariff Commission.

Survey Mineral Data Used in Paris

Important use was made at the Peace Conference of the U. S. Geological Survey's data on foreign mineral deposits, according to J. B. Umpleby, who has just returned from Paris, whither he took the extensive exhibit. In fact, these data were practically the sole source of information for the territorial and economic specialists in considering the mineral aspects of the situation. There were scores of mineral problems, of which the following are typical: The dispute between Poland and Czechoslovakia concerning the Teschen coal fields; the oil fields of Roumania; the relation of the Idria mercury deposits in the area represented by the Fiume controversy; the value of German colonial mineral

deposits; the coal resources of the. Sarre valley; the iron-ore resources of German Lorraine; and the mineral deposits in the Shantung region.

In the opinion of Mr. Umpleby, it will be five years before the iron and steel output of the Minette region will regain the 1913 volume of production. This is due not so much to reduced furnace capacity as to reduction in the coke capacity of adjacent coal fields. Mr. Umpleby is also of the opinion that Asia Minor will attract great attention from mining men, if stable governments are established in that region.

In the course of his work Mr. Umpleby was brought into contact with information regarding the fuel situation in Europe. In his opinion that situation is serious. Not only are supplies short for industries, but they are insufficient to insure the domestic population against serious hardships this winter. English production has been cut down by generally understood causes; strikes have interfered materially with the output from the Westphalian basin, and the disputes between the Poles and the Czechoslovaks have almost stopped coal mining in the upper Silesian basin. Belgium will have no coal for exporting. Lack of production is only one factor, as transportation offers almost as serious a problem.

The action of the German armies in destroying the coal mines and in preserving the iron mines in the territory they occupied is regarded by Mr. Umpleby as cold-blooded foresight, since Germany was an exporter of coal and an importer of iron ore.

War-Minerals Work Delayed

Delay in classifying the war-minerals claims geographically and by metals is resulting because some of the claims are in the hands of the War-Minerals Relief Commission, which is holding hearings at points easy of access from the mining districts. It was necessary for the commission to take many claims for use at hearings. As soon as these claims can be returned to Washington and placed in the hands of the clerical force, a number of important tabulations will be made.

Despite the fact that June 2 is specified by the law as the last day on which claims may be received, they are coming in at almost the same average as was the case prior to that date. No record, however, is being made of such claims.

The following procedure has been adopted in connection with claims arising under the act of Mar. 2, 1919, known as the Minerals Relief Act, according to an announcement made on June 16, by the Secretary of the Interior, Franklin K. Lane:

"The findings of the Minerals Relief Commission will be made and thereafter 20 days will be allowed claimant to file typewritten or printed brief based upon the record already made, making such comment on the commission's findings as may be desired. At the end of 20 days the case will be finally submitted to the Secretary of the Interior. No new facts will be considered, those which have been submitted to the commission only being given consideration. No oral argument will be heard."

Tariff on Tungsten Sought

A straight protective tariff on tungsten is being urged upon the Ways and Means Committee of the House of Representatives by the domestic producers. Representative Timberlake, of Colorado, has introduced a bill (House Bill 4437) providing that the duty shall be $10 per unit of tungsten trioxide, or $1 per lb., in the case of imports of metallic tungsten, tungsten powder, ferrotungsten, commercial tungstic acid, calcium tungstate, sodium tungstate, and all other salts of tungsten and other manufactured materials containing tungsten, including high-speed tungsten steel, all alloy steels containing tungsten, and all other compounds containing tungsten. The hearings were opened on June 10.

A telegram from Colorado producers was presented to the committee. It pointed out that all the Colorado mines and mills are closed and that two of the largest mills are being dismantled. Owners of other tungsten properties are considering similar action, it was stated. The mines already have sustained great damage, it was said, because no one without more encouragement than is offered at present is willing to go to the expense of keeping them free of water. The producers called attention to the fact that $3,000,000 has been expended in developing the industry, $1,000,000 of which went for the purchase of the 21 mills in the Colorado tungsten district. The industry, it was said, employs 1500 men, at an average daily wage of $4.85.

J. H. Holmes, Jr., is the authorized representative of the producers in attendance at the hearing. The principal argument for the duty was made by Representative Timberlake, who, in presenting the usual arguments in favor of a protective tariff, included a comparison of the wage and living scales between the tungsten producing sections of China and South America with those of the United States.

The new bill was designed to replace Mr. Timberlake's previous bill, which inadvertently allowed the free entry of ferrotungsten from American Pacific islands, and wherein no definite provision was made to prevent such free entry of ferro manufactured from Chinese or other foreign ore. Nelson Franklin, of Denver, and J. H. Holmes, Jr., of Boulder, were in attendance.

Other tariff bills may come up for hearing at any time, and those interested in manganese, chrome, pyrites, magnesite, antimony, barytes, mercury, mica, molybdenum, sulphur, potash, and graphite have been urged to transmit information promptly to Nelson Franklin or J. H. Holmes, Jr., at the headquarters of the American Mining Congress, Washington, D. C.

May Import German Periodicals

The War Trade Board announced on June 13 that applications will be considered for licenses to import into the United States from Germany or elsewhere scientific books and journals which were printed in Germany. Licenses covering such importations will not, however, be issued until the importer in the United States has made effective arrangements to make the purchase price of such books or journals available for the purchase of foodstuffs for Germany, by depositing said purchase price with the American Relief Administration for remittance through said administration to the persons thereto entitled. The duplicate receipt issued by the American Relief Administration must be submitted to the Bureau of Imports of the War Trade Board when applications for such licenses are filed. In cases where the purchase price has been paid prior to Apr. 6, 1917, payment of the purchase price to the American Relief Administration above referred to will not be required. Conclusive proof of such prior payment must be furnished.

American Zinc Institute Holds Annual Meeting in St. Louis

ZINC has been shorn of its nicknames. Spelter, blende, jack, and like misnomers have been cast aside. This is one of the objects which has been attained by the American Zinc Institute during its ten months' existence. Members of the Institute, numbering 140 and representing practically every zinc-mining and zinc-smelting interest in the United States, met in annual convention at St. Louis on June 9 and 10, and, among other things, decided that zinc is zinc, and nothing else. Already many trade papers and the U. S. Geological Survey and the Bureau of Mines have agreed to call zinc by its right name.

The members were cordially welcomed by Hon. Henry W. Kiel, Mayor of St. Louis, and a felicitous reply was made by F. C. Wallower, of the Golden Rod Mining and Smelting Corporation. The members also adopted the slogan "Make It of Zinc," and this trenchant advice is to be blazoned throughout the country. Another worthy object accomplished was the practical obliteration of the differentiation between zinc miners and zinc smelters. This was commented upon by Charles T. Orr, president of the Institute, at the closing session. The invitation to join the Chamber of Commerce of the United States was accepted by the Institute, and Charles T. Orr was named as national councillor.

The annual dinner at the Hotel Statler was largely attended. Dr. W. F. Gephart, dean of finance and economics at Washington University, St. Louis, acted as toastmaster, and Edward Gengenbach, industrial commissioner of the St. Louis Chamber of Commerce, spoke on "Confidence and Progress." Pope Yeatman, at whose suggestion the Institute was formed, journeyed from New York to St. Louis to meet his old friends in the zinc world, and to talk to them on the "Influences of the War on the Zinc Industry." The speeches of the evening dealt with present and future conditions in the business world, the dominant note being "forward, march!" The members voted to ask George C. Stone to make in person, in the interests of the Institute, a survey of zinc conditions in Europe. Mr. Stone expects to sail early in July.

New uses for zinc were discussed at length, the papers on this subject being read by George C. Stone, by E. H. Wolff, general manager of the Illinois Zinc Co., and by George S. Harney, of the American Zinc Products Co. The presentation of these papers was followed by a lively discussion on the part of the other members of the Institute, and resulted in the board of directors setting aside a considerable amount of money to advance this work. In this connection the plans of Dr. John Johnston, who during the war was an active member of the National Research Council, were referred to the proper committee for a prompt report to the board of directors.

Among the other interesting papers read at the meetings were the following: "Some Causes of the Unsound Economic Position of the Zinc Industry in the United States," by William A. Ogg, president American Zinc, Lead and Smelting Co.; "Tri-State Mining and Production," by Otto Ruhl, C. E., Joplin, Mo.; "Mining and Production in Wisconsin," by A. M. Plumb, Wisconsin Zinc Co.; "Production of Zinc in the Southeastern States," by J. N. Houser, vice-president, American Zinc, Lead and Smelting Co.

One of the most interesting papers presented was that on "Early Days of the Industry," by C. E. Siebenthal, of the U. S. Geological Survey. The Geological Survey, largely owing to the efforts of Mr. Siebenthal, has had for some time the story of zinc since 1880, and Mr. Siebenthal, by patient research, has completed the gathering of information respecting the industry prior to that time. Another interesting paper of the meeting was that by R. C. Allen, director, Geological and Biological Survey, Michigan, on "Mines Taxation."

A budget and financial plan were approved by the members, which now number nearly 200, and the following officers and directors were elected:

OFFICERS

Term expiring 1920: President, Charles T. Orr; first vice-president, Edgar Palmer; second vice-president, James L. Bruce; third vice-president, F. C. Wallower; treasurer, Howard I. Young; secretary, Stephen S. Tuthill.

BOARD OF DIRECTORS

Term expiring 1920: George O. Argall, Joseph Brennemann, Arthur Thacher, C. M. Loeb, Edward M. McIlvain, George E. Nicholson, F. C. Wallower; term expiring 1921: J. H. Billingsley, P. B. Butler, Julius W. Hegeler, Cornelius F. Kelley, William A. Ogg, Edgar Palmer, O. S. Picher; term expiring 1922: James L. Bruce, A. P. Cobb, A. S. McMillan, Charles T. Orr, Victor Rakowsky, William Rossman, E. H. Wolff.

A pleasing innovation was the interesting moving picture lecture by B. F. Tillson, at the close of the Monday meeting, the title of the film being "Safety Lessons in Metal Mining." On Monday and Tuesday luncheon was served to the members, in the grill adjoining the meeting room. The badges were made of zinc, and a diversified exhibit of new uses for zinc was displayed at the unique registration booth of the Institute in the corridor of the Hotel Statler.

Upon the adjournment of the meeting on Tuesday, it was the opinion that the American Zinc Institute had become a permanent institution, and that through its efforts the American zinc industry was being stabilized.

The next meeting is to be held in Chicago, the second Monday in May, 1920. The voting of a working budget of $20,000 for 1919-1920 augurs success in working out the aims of the Institute.

Petroleum Institute Favored

Petroleum refiners of the United States are urging that a petroleum institute be established, with headquarters in Washington, that will serve during peace in similar capacity as did the petroleum war-service committee during the war. The fact that stocks of petroleum oils are rapidly decreasing in the face of a greatly increasing demand calls for more scientific oversight and efficiency than are possible under present conditions. It is thought that Government action in this direction will be forced, owing to urgent necessity,

unless those in the industry coöperate to bring about the desired end.

Speaking of a petroleum institute, Mark L. Requa said: "In the field of production, in the field of refining, and in the field of marketing and foreign trade, a petroleum institute can render a service to the industry which can be secured in no other way."

As to the question whether such an institute would work, Mr. Requa said no organization can long exist that attempts to run counter to economic laws; that penalizes one party at the expense of another; that attempts to set up artificial currents of trade or that circumscribes individual effort.

Mr. Requa said, further, that the objects of the institute shall be in all lawful ways to afford a means of coöperation with the Government in all matters of national concern; to foster foreign and domestic trade in American petroleum products; to promote in general the interests of the petroleum industry in all its branches; to promote the mutual improvement of its members and the study of the arts and sciences connected with the petroleum industry.

It was pointed out by Mr. Requa that the organization would not be created for the purpose of becoming a lobby. He said that similar plans are under consideration in practically every European country.

Ontario Mineral Production

Returns received by the Ontario Bureau of Mines for the three months ended Mar. 31, 1919, are tabulated below, the figures for the corresponding period in 1918 being given for comparison:

	1918	1919
Gold, oz	113,387	98,188
Silver, oz	4,114,856	3,105,002
Copper, blister, lb	.....	1,724,631
Copper in matte, tons	4,727	2,674
Nickel in matte, tons	9,677	5,610
Iron ore exported, (a) tons	501	4,840
Iron, pig, (b) tons	17,404	14,170
Cobalt, metallic, lb	37,545	13,594
Cobalt oxide, lb	81,760	127,954
Nickel oxide, lb	.....	5,070
Nickel, metallic, lb	44,154	1,830,569
Other nickel and cobalt compounds, lb	143,381	31,370
Lead, pig, lb	60,283	567,716
Molybdenite, concentrates, lb	17,410	.....

(a) Includes briquettes. Total shipments of iron ore to both foreign and domestic points in 1919 were 33,376 short tons. (b) Total output of pig iron was 170,325 tons. Figures in the table represent proportional product from Ontario ore.

Although the gold output shows a decrease of 24,104 oz., as compared with the first quarter of 1918, the outlook is such that a substantial increase may be expected for the full year. With the Dome mill, now in operation at Porcupine, and the Kirkland Lake and Tough-Oakes mills, at Kirkland Lake, an improved showing is anticipated for the half-year report. A great deal of interest is being shown in the gold fields of northern Ontario, and much prospecting and development of new properties are in evidence. In the period, with the exception of a few days at the end of March, only the Hollinger and McIntyre mills were operating at Porcupine, and at Kirkland Lake the Lake Shore and Teck-Hughes were the only mills at work. For the quarter 206,603 tons of ore was milled, as compared with 262,577 tons milled in 1918.

Silver from Cobalt and outlying silver camps was marketed to the extent of 3,080,104 oz. In addition, 24,878 oz. was recovered from the refining of gold ores and nickel-copper matte. Mines producing over 250,000 oz. are given in order: Nipissing, Mining Corporation of Canada, Kerr Lake, McKinley-Darragh-Savage. Some rich ore running over 8000 oz. to the ton has been taken from the Foster mine, under lease to Messrs. Campbell and Fairbairn.

Southern Ontario refineries treated 1257 tons of ore and concentrates, and 919 tons of residues, recovering therefrom 1,354,441 oz. of silver, in addition to the cobalt and nickel compounds, as enumerated in the table. Although 170,478 lb. of metallic nickel was produced, only 16,284 lb. was marketed.

Of nickel-copper ore, 229,822 tons was raised and 226,954 tons smelted, as compared with 354,689 and 325,386 tons, respectively, for the first quarter of 1918. The cessation of hostilities immediately resulted in a decreased nickel demand, and the period of reconstruction has not yet provided a market sufficiently large to absorb the war-basis output. In consequence, there has been a great curtailment in production, both by the International and Mond companies. Of a total output of 12,529 tons of bessemer matte, 2960 tons was refined at the Port Colborne plant of the International Nickel Co. of Canada, the products being metallic nickel, blister copper, silver, and gold. The last two mentioned are present in small proportion. Heretofore the only metallic nickel recovered in Ontario was the small quantity obtained by the several refineries which treat the silver-cobalt-nickel ores of Cobalt. Since the Port Colborne plant began operations in July of last year, metallic nickel has been produced within the province from nickel-copper ores.

Iron ore smelted in the period by six companies operating 10 blast furnaces was 362,656 tons, of which 332,479 tons was imported from the United States. The total output of pig iron was 170,325 tons. Steel produced by the Algoma Steel Corporation and the Steel Co. of Canada totaled 194,505 tons. In addition, there was an output at the "Soo" of 11,631 tons of spiegel and 107,635 tons of coke.

It has not been profitable to operate molybdenite mines since the close of the war, owing to decreased demand.

Gypsum Output in 1918

The total quantity of crude gypsum mined in the United States in 1918 was 2,056,462 short tons, a decrease of 639,764 tons, or 24%, according to R. W. Stone, of the U. S. Geological Survey.

CRUDE GYPSUM MINED IN THE UNITED STATES, 1917–18, IN SHORT TONS

State	1917	1918
California	30,552	(a)
Iowa	461,864	327,927
Kansas	79,331	54,958
Michigan	375,803	286,768
New York	606,268	531,038
Ohio	270,538	199,456
Oklahoma	158,017	126,208
Texas	257,328	157,388
Wyoming	55,844	41,877
Other States b	400,681	330,842
Total	2,696,226	2,056,462

(a) Included with "Other States." b Includes, 1917: Alaska, Arizona, Colorado, Montana, Nevada, New Mexico, Oregon, South Dakota, Utah, Virginia; 1918: Arizona, California, Colorado, Montana, Nevada, New Mexico, Oregon, South Dakota, Utah, Virginia.

The decrease in production was least in New York, where the output fell off only 12%; in Oklahoma, Michigan, and Ohio the decrease was 20 to 26%, or about the average for the country. Texas recorded the greatest reduction in output, or about 39%. Utah was the only state that produced more gypsum in 1918 than in 1917.

Editorials

A Change in Mexican Policy

THE prompt dispatch of American troops into Mexican territory on the morning of June 16 suggests a change of policy in the handling of border disturbances, and we congratulate the authorities on the vigor with which the action was taken. There is, however, another phase of the situation, which we hope has been fully considered. Villa is a rather resentful bandit, and the assistance rendered by the Americans to the Juarez garrison in driving Villa's men south will not be appreciated by him. There are a number of Americans in Mexico upon whom Villa can easily place his hands, and they are likely to suffer the consequence of this last excursion unless it is followed up with sufficient activity to impress upon Villa that we can and sometimes will fight.

Speaker Gillett and Mexico

AT A SESSION of the second Pan-American Commercial Conference, Frederick H. Gillett, the new Speaker of the House of Representatives, took Mexico severely to task for her failure to remedy the unsatisfactory conditions which exist in that country. He stated that present conditions were an obstruction to trade and that no merchant would risk profits in Mexico while foreign capital is unprotected and the nationals of other countries may not live in security there. He urged unity of action by the other American republics to remedy the situation. In a subsequent statement he declared:

"I believe that every nation should be alert to guard its citizens wherever they may be, and I trust our South American friends hold the same opinion and will coöperate with us in asserting and enforcing it."

The frank statement of Speaker Gillett will be appreciated by mining men and engineers who are interested in Mexico. Coming as it did unexpectedly at the conference, his words have had the effect of directing attention in no uncertain way to the Mexican question.

All that is asked from Mexico is protection of life and property. This is the prime requisite of a government. Granting that the Mexican authorities have had and are having great difficulty in bringing order out of the chaotic conditions, the fact remains that it is to the best interests of Mexico to take the most energetic steps to eliminate banditry and lawlessness. It is the duty of our Government to see that this is done in so far as American interests are affected.

European Conditions

IT IS A HUMAN failing to underestimate conditions which do not come under our direct observation. We are also sometimes guilty of exaggeration when we try to convey to another individual an account of a happening which we have ourselves observed. Perhaps this tendency to exaggerate is caused by an unconscious feeling that many of our listeners have the failing first mentioned. There is, however, little exaggeration in the accounts of European conditions which come to us. It is probably beyond the power of any one mind to survey the whole and convey an adequate picture of Continental Europe. Hence, there is food for thought and especial significance when a man like Frank A. Vanderlip says:

> The situation in Europe is more serious than has been grasped on this continent; more serious indeed than has been grasped by a good many Europeans as yet.
>
> Superficially, you would see something like a normal Europe if you had been over the ground that I have—London, living its great luxurious life as usual; Paris, much the same. Superficially, you might think no greater thing had happened to Europe. You might well be excused after seeing Europe if you still held the belief which I think most people do hold in the United States: that the war is over; that, of course, it has been a great blow; that there has been a sad devastation, but that it is over, and with the signing of peace Europe will pretty rapidly tend back toward the normal; that there is a great industrial skillful people; that there are great territories quite unharmed by the war; that the hurt of the war, after all, is comparatively small, and that all that is needed is a little time to bring Europe back to pretty nearly its pre-war conditions.
>
> Now, that picture is not true. Europe has received such a shock from the war as has not been measured by those who have seen it at close range, but it is not that direct shock that concerns me nearly as much as a greater hurt, the hurt of disorder, industrially, over that Continent, a disorder so great that industry is in a large measure paralyzed. Men in great numbers are idle. The difficulties of restarting the industrial cycle are almost unmeasured, and the consequences that will flow from continual idleness and want and hunger from revolution which will follow on that combination if it lasts long enough will involve two hemispheres; they cannot be confined to one, should they occur.
>
> Now, don't understand me as predicting a conflagration in Europe. I don't believe there is to be such a conflagration, but I believe Europe is balancing on a knife edge.
>
> I think it can be saved. I think aid can be given to those European states that will help them restart industrially, that will help them put their people at work, and no one can save Europe but European people. They can't be saved in idleness; they must be saved by the sweat of their brow and labor.

We must take into consideration the affairs of the countries across the Atlantic when we are reviewing our own conditions. Mr. Vanderlip's account should jolt us out of our tacit underestimation of the world situation in respect to ourselves. We are no longer insular. We have a leading part to play.

Unquestionably we are doing our share in relieving the food shortage. But this is only a part of the problem. Our neighbors must be saved by labor—by the sweat of their brow. In these illuminating words Mr. Vanderlip has touched a great fundamental truth which contains the solution of difficulties represented by the prevailing unrest.

A busy man is nearly always a happy man. He is also a useful man. In proportion as industry is resumed in England and Continental Europe, so will unrest be diminished.

One important circumstance that has operated to

prevent a resumption of normal industrial life, and that we hope will soon be eliminated, is the prolongation of the peace negotiations. This has affected our own industries as well as those of all of our neighbors. It is imperative that there be whole-souled coöperation of America with Europe. Whether that course be popular or not, our country must assume the duties and responsibilities that the Great War and the conditions resulting from it forced upon us. We have got to be prepared to make sacrifices. In a word we must take a broad view of the problem, and act accordingly.

Transatlantic Flight

ON JUNE 15, 1919, Capt. Jack Alcock and Lieut. Arthur W. Brown completed an airplane flight of 1932 miles, from St. John's, Newfoundland, to Clifden, Ireland, in 16 hours and 12 minutes, at an average speed of nearly 120 miles per hour. This historic feat was accomplished under unfavorable weather conditions, and must be regarded as a great victory not only for the intrepid aviators, but also for the airplane. The machine was a Vickers biplane equipped with a Rolls-Royce engine.

An achievement of this character always carries with it interesting and valuable suggestions to the scientist and the engineer. For example, it demonstrates in a most conspicuous manner the great possibilities of the internal combustion engine wherein high power is combined with light weight, and carries with it the suggestion that the factor of horsepower per pound of metal, in any mine or mill power plant, may be worthy of consideration by the mining engineer who is called upon to recommend power equipment for temporary purposes, or where the transportation problem is difficult.

Concrete in Mining

MORE and more is the use of concrete gaining recognition among mining engineers. It has the important advantages of high compressive strength and of being fireproof and easy of application, and it is not highly expensive except where the mine is so situated that the bringing in of materials and supplies involves high transportation charges. In addition, two advantages attend its use which are sometimes not given the attention which they deserve. One is that the concrete acts as an effective water seal and materially reduces the movement of underground water in the vicinity where it is placed. Ordinary timber support will not do this. As the movement of underground water is often a contributory cause of the development of rock pressure or movement which results in pressure upon the timbers, it is obvious that the judicious use of concrete where timbers regularly fail due to cumulative rock pressure may go far toward remedying that difficulty.

The second advantage is that the rock surface is covered and the action of the atmosphere largely prevented. Just how much loosening of the rock mass bounding an excavation may be due to the disintegrating action of the air is problematical, but it is within the experience of most mining engineers that, as time elapses, the walls of some mine excavations begin to fail as a result of this action. Timber support does not stop it, though it may retard it to a certain extent. On the other hand, a relatively thin skin of concrete is an effective stop.

The most important objection to the use of concrete, excepting its cost under the unfavorable conditions mentioned, is its inability to resist tensile forces. It is, therefore, best used in such a form as to avoid tensile stress within the mass. By the use of steel reinforcement this objection can to a considerable degree be overcome. Reinforced steel-concrete beams, as well as flat slabs of the same material, have been successfully used in mining operations.

Where there is extensive movement in rock masses not due to superficial causes the use of concrete is not indicated. On the other hand, if concrete is used under cumulative pressures it is necessary to use a sufficient thickness to resist fully the maximum pressure that may be expected to develop during the life of the structure, as concrete structures cannot be eased, as is done where timbers are employed under similar circumstances.

For air stoppings, bulkheads, and dams concrete possesses important advantages. In an article in this issue the use of concrete as a lining and support for ore chutes and bins, as well as for the support of a shaft in swelling ground, is described. The examples are worth the attention of mining engineers.

To build from the foundation upward appeals to the constructive mind. There is an inborn instinct in the human race to recognize fundamentals, whether they apply to the construction of a mining plant or have to do with a sociological problem. It is because of this admirable quality that the Boy Scout movement derives especial force in making its appeal for support. The movement has for its purpose the direction of the boy's activity into useful and wholesome purposes. The school occupies a considerable part of the youth's time. Chores consume another part, but there is a relatively large amount of time that under ordinary circumstances is given over to play. The problem is to direct the boy's play into channels that will develop character and manliness. Too often the boy is allowed to direct his own play activities, with the result that the outcome is not always a happy one. A clean, useful citizen is the hoped-for product of the boy. Left to chance, the surprising thing is that so many boys turn out well. Intelligent, systematic direction of the boy's activities will produce more men who will be physically fit and capable of wholesome fun. The Boy Scout movement deserves the support of every grown man. Those who are back of this movement should be made to feel by the support that is given them that their work is recognized as of substantial benefit to the community. Particularly is it necessary to initiate and support the movement in our mining communities, for there the conditions are not especially favorable for youth.

Close control upon the distribution of explosives was effected during the war period. Subsequent developments in the anarchistic menace raise the question as to whether it is not an excellent thing to continue this regulation, modified to some extent to conform with existing conditions. Director Manning of the U. S. Bureau of Mines calls attention to the inadequacy of state laws to prevent unauthorized persons from obtaining explosives. The recent bomb outrages fully demonstrate the necessity for stringent control. With the signing of peace the Federal regulations will lapse. It is highly desirable that uniform state or Federal laws

be drafted to cover the situation. Delay only increases the possibility of additional depredations. There is urgent necessity, therefore, for prompt action to provide for severe restrictions against the sale of explosives to individuals who can give no proper reason for possessing them or accounting for their use.

There is encouragement in the oil-speculation situation when reputable oil men resent the methods employed by unscrupulous promotors and dishonest brokers. It is difficult to distinguish between the legitimate enterprise and the stock-selling job. To prevent being tarred by the same stick, the men who have the best interests of the oil industry at heart must organize to lend their efforts, as well as their moral support, to the legal authorities whose business it is to protect the investing public from fraud. Bankers and commercial interests in oil-development communities should coöperate to protect the good name of their localities, for their prosperity may depend upon substantial, well-organized and honest development of local resources.

A significant move that will perhaps be of far-reaching importance is seen in the admittance of negroes into the rights and privileges of the labor unions by the American Federation of Labor at its recent Atlantic City convention. The immediate effect will be to increase largely the number of organized workers in many communities, particularly in the Southern States, and also in some of the Northern States into which negro laborers have gone in large numbers in response to the demands for labor growing out of the exigencies of the war. In part, at least, this recognition of the negro workmen will be beneficial, in that it removes one form of repression with which our negro population has had to contend. In proportion as the American Federation uses wisdom and justice in directing the destinies of organized labor, so will benefit accrue not only to the country as a whole but to the negro population as well. A broad policy, conceived not along narrow and selfish lines, but with the interests of the entire citizenry taken into consideration, will be of lasting good to all concerned.

BY THE WAY

Speaking of accidents in the early days of Nevada mining, Dan de Quille, in "The Big Bonanza," says that it was by no means unusual for the remains of men to be collected at the bottom of a mine and sent to the surface in candle boxes—to such an extent are the bodies and limbs of many who fall into shafts rent and scattered. On one occasion of this kind when the jury of inquest had finished hearing the testimony, and were sitting silent around the fragmentary remains, considering their verdict, a man came hurriedly in with a candle box under his arm, approached the foreman, and said to him in a reverent tone: "Wait a moment, please—I've got some more of him."

"Never did tell 'e tha story of 'ow Tom Trevarthen barely missed makin' a fortun', did I, m'son?" said Cap'n Dick. "H'only gaws to show 'ow does'nt do too much to trus' to 'uman natur', an' tha moor a man 'olds to 'imsel', tha better h'off 'e be. Tommy, 'e wuz workin' on contrac' in a gol' an silver mine h'out Wes'. Baout that time h'everybody wuz gawin wild on these 'ere minin' stocks, an' tha market wuz boomin'. H'every time a strike wuz made h'up would gaw tha stock o' tha mine w'ere she wuz to. Tommy an' 'is partner 'ad jus' shot h'off a blas', an', gawin' back to see 'ow tha 'oles 'ad blawn, they foun' tha shootin' 'ad struck a gert bunch o' this 'ere 'orn silver. Baout that time 'long come super an' sees un. 'Boys,' sez 'e, 'say nothin' baout this 'ere. Keep yer mouth shut an' we'll make some money.' So Tommy an' 'is partner gaws h'up shaf' an' says never a word. That night, super 'e gaws to tha h'engine room, bursts tha compressor with a 'ammer, an' next moornin' w'en shif' comes on 'e tells all to gaw 'ome, that tha mine's to be laid h'up for repairs. Then dam-me, 'e takes next train for tha city, tells the manager w'ot's h'up, an' fixes with 'im to keep the mine closed. Super, 'e figgers tha manager an' 'im 'd sell their stock; tha mine bein' closed daown, tha stock 'd gaw daown, an' they'd buy at tha low price an 'start tha mine h'again. Meantime, Tom an' 'is partner wuz sittin' tight an' wonderin' 'ow much they'd make h'on tha deal. Tha super, 'e sold 'is stock an' spent tha time standin' raound waitin' for tha market to 'it bottom, but, dam-me, h'up she stays, an' 'e can't figger un h'out. Truth to tell, tha manager, 'e wuz buyin' h'all tha stock, an' w'en 'e 'ad un h'all 'e fires tha super an' runs tha bloody mine 'imself. An' dos't thee naw, m'son, tha stock's payin' regular naow. But Tommy Trevarthen, 'e's still workin' for day's pay. W'ot's think on un, any'ow?"

It is a regrettable but undeniable fact that some mines crowd into the limelight of technical literature, to a degree somewhat disproportionate to their past, present, or potential production; and other properties, like the little old car of well-known fame, ramble right along and produce fat dividends for their fortunate owners, never seeking publicity of the sort that promotes stock sales. Years ago in a slightly advertised section of the State of Sinaloa, Mexico, a herdsman, while searching for a stray animal, lost his rosary, which caught on a twig, which snatched it from about his neck. Wishing to recover his keepsake as well as the animal, he tossed his hat down to mark the spot. Although night overtook him, when he returned from his chase, he had no difficulty in finding his hat. Philosophically, he built a fire and camped on the spot, intending to search for the precious beads by daylight. Along in the wee small hours he rolled a cigarette for breakfast. While lighting his corn-husk soother in the lingering coals of the campfire he noticed a peculiar glistening substance that had not been in evidence the night before. After due investigation by his employer, the substance was pronounced to be silver, which it most certainly was; though possibly contaminated (?) by 30 to 50% of gold. Such is the story told to account for the name of the mining district of The Rosary, or *El Rosario*. The principal mine of the district, known as El Tajo, was owned in 1883 by a Mr. Bradbury, a Mr. Kelly, and others of Mazatlán. Though the nominal capitalization of the company is rated at only $120,960, Mexican currency, the 1909 production was reported as $572,000, and the dividend distribution for that year as just $225,000 U. S. currency. Query : Do the Bradburys oppose cigarettes?

Personals

A. P. Watt is in Virginia.

W. W. Mein has returned from Nicaragua.

R. B. Lamb, of New York, is in Colorado on professional work.

A. F. Victor is sales manager of the Lake Superior Loader Co., Duluth, Minn.

O. Wiser, president of the Republic Mining and Milling Co., at Hanover, N. M., is in New York on company business.

Jay A. Carpenter visited Pioche, Manhattan, and Rochester, Nev., recently on professional business.

John A. Udden is chief geologist with the Sinclair Gulf Oil Co., Burk-Burnett Bldg., Fort Worth, Texas.

Capt. John D. Hubbard is superintendent of the Forks of Salmon River Mining Co., Siskiyou County, California.

George A. Laird has become connected with the office of W. G. Williams, consulting engineer, of Oklahoma City.

Horace F. Lunt has been appointed Commissioner of Mines for the State of Colorado, succeeding **Fred Carroll**, who has resigned.

J. M. Sias, of the iron-ore department of the United States Steel Corporation, New York, returned recently from a five months' stay in Brazil.

R. G. Hall, resident manager Burma Mines, Ltd., has left Namtu, Northern Shan States, Burma, for London, on business for the corporation.

L. S. Cates, general manager, Ray Consolidated Copper Co., of Ray, Ariz., is visiting the larger mining camps of the southern part of Arizona.

W. H. Janney, who has been in charge of Chino Copper Company's mill at Hurley, N. M., is recovering from a recent operation upon his eye.

H. G. Officer, of the Andes Copper Co., of Potrerillos, Chile, recently visited Ajo, Ariz., where he inspected the operations of the New Cornelia Copper Co.

George W. Chamberlain has been appointed chief engineer of the Minnesota mines of the Tod-Stambaugh Co., with headquarters in the Alworth building, Duluth.

C. B. Swan, of Medicine Hat, Alberta, an experienced oil operator, has been delegated by the Alberta government to make a thorough inspection of the Peace River oil field.

Lieut. Lewis Douglas, mining engineer, the son of **James S. Douglas**, of the Verde Extension, has just returned from France and is recovering from an operation for appendicitis.

G. M. Butler, director of the Arizona Bureau of Mines, was reëlected president of the Southwestern Society of Engineers at the annual convention held recently in El Paso, Texas.

J. C. Gwillim, of Queen's University, Kingston, Ontario, will make an examination of the foothill country in Alberta to determine whether iron ore occurs in commercial quantities.

Norman Carmichael, governor of the Arizona Chapter, American Mining Congress, of Clifton, Ariz., was a visitor to Phoenix on June 5 and 6, where he presided at a meeting of the chapter.

James F. Rose, mining engineer, of Hibbing, Minn., has left for Canada, where he will have charge of 200 miles of reconnaissance survey for the Canadian Pacific Ry. The work will lie north of Ottawa.

J. A. Burgess, general manager, United Eastern Mining Co., Oatman, Ariz., is visiting Phoenix, where he will appear before the Arizona Tax Commission with reference to 1919 valuations for assessment purposes.

C. J. Sarle and **M. Ehle**, professors of the departments of geology and mining engineering, respectively, of the University of Arizona, will conduct a summer field course in geology and mining, to begin July 1 and end Aug. 18.

Daniel C. Jackling and **William B. Thompson** are on the board of directors of the Sinclair Consolidated Oil Corporation. Mr. Jackling has recently inspected the Chino Copper Co.'s property at Santa Rita and Hurley, New Mexico.

Francis J. Webb, general manager of the northern ore mines of the Republic Iron and Steel Co., and **John N. Reese**, assistant to the vice-president of the company, have completed a tour of the company's Minnesota and Michigan iron mines.

William B. Daly, formerly general superintendent of the Anaconda Copper Mining Co., has been promoted to be assistant general manager of mines. **Chauncey L. Berrien**, who was assistant superintendent, assumes Mr. Daly's former place.

E. L. Porch, Jr., has opened an office in the Alamo National Bank Bldg., at San Antonio, as a petroleum geologist and mining engineer. Mr. Porch was formerly assistant geologist in the Texas Bureau of Economic Geology at Austin, and served during the war as a first lieutenant in the Aviation Service.

H. E. T. Haultain, formerly professor of mining in the University of Toronto, and for some time director of vocational training in connection with the Soldiers' Civil Reëstablishment Department, has resigned his position. Professor Haultain believes that all positions in the organization can be filled by returned soldiers.

Societies

Society for the Promotion of Engineering Education will hold its 27th annual meeting at the Johns Hopkins University, Baltimore, Md., June 25-28, 1919. John B. Whitehead is chairman of the local committee. Officers for the meeting are: John F. Hayford, president; John T. Faig and E. R. Maurer, vice-presidents; W. O. Wiley, treasurer, and F. L. Bishop, secretary.

American Institute of Mining and Metallurgical Engineers, New York Section, will hold the monthly meeting on June 26 at the Machinery Club, 50 Church St. Dinner will be served at 6.30 p.m., and program will begin at 8 p.m. An address will be made by Maj. A. S. Dwight, on "War Experiences," which will be illustrated by moving pictures. Horace V. Winchell, president, will also speak.

Engineers Club of Northern Minnesota will entertain, on June 21, the national convention of the American Society of Civil Engineers, adjourned from Minneapolis, and the members of the Duluth Engineers' Club. A part of the entertainment will be an automobile trip across the range from Hibbing to Eveleth. A conservative estimate places the number of guests and members likely to be present at 500.

Lake Superior Mining Institute's plans for the next meeting are indefinite, although it was intended to hold a session in the copper country this summer, and the possibility of a joint meeting with the American Institute of Mining and Metallurgical Engineers at Chicago in September has been discussed. It is probable that a meeting of the council will be held at an early date, at which time a decision will be reached. The last gathering was held at Birmingham, Ala., in March, 1917.

Colorado Engineering Council, at its last regular business meeting, appointed H. S. Sands, of the Westinghouse Electric & Manufacturing Co., as chairman of a committee to present to the council a report on "Governing Factors in the Return of the Wire Transportation Systems to Their Owners." L. G. Carpenter was appointed chairman of a similar committee to present to the council a report on "Governing Factors in the Return of the Rail Transportation Systems to Their Owners." It is desired by the council to use the substance of these reports for preparing a statement to be issued to Colorado representatives in Congress at an early date.

American Institute of Chemical Engineers held the eleventh semi-annual meeting at Boston, Mass., on June 18 to 21. Some of the papers, among many important ones, were as follows: "The Future of the Electric Furnace," by C. T. Bragg, of the Michigan Smelting and Refining Co.; "Utilization of Electric Brass Furnaces," by W. H. Gillette, Bureau of Mines; "Problems Encountered in Electric Furnace Practice," by P. E. McKinney, Washington Navy Yard; "Electric Furnaces of the Resistance Type—III" (motion pictures) by T. E. Baily, of the Electric Furnace Co.; "Ajax-Wyatt Induction Furnace" (slides), by G. H. Clamer, Ajax Metal Co.; "Some Practical Results Secured With High-Frequency Induction Furnaces," by Edwin F. Northrup Palmer Physical Laboratory, Princeton University; "Booth-Hall Rotating Furnace" (motion pictures), by Cart H. Booth, Booth-Hall Co.; "Rocking Electric Arc Furnace," by E. L. Crosby, the Detroit Furnace Co.

Industrial News

Du Pont Chemical Company, Wilmington, Del., announces the removal of the executive and sales offices to new quarters on Vandever Ave., east of Market St.

The Borden Co., manufacturer of Beaver pipe tools, has opened offices at Room 501, No. 549 West Washington Boulevard, Chicago. Charles A. Greene is the Chicago representative.

The Royal Netherland Legation, Washington, D. C., has recently established a commercial department for the express purpose of fostering trade between the United States and Holland, and is in a position also to give commercial information about trade between the two countries to American merchants.

Rosenburg & Co., machinery dealer, has moved its offices and sales rooms to 303-305 East 3rd St., Los Angeles, Calif. In addition to the large stock of new and used mining and smelting equipment at its Los Angeles plant, this firm has just purchased the equipment of the Lincoln Mine at Crown King, Ariz. The latter will be moved to Rosenburg & Co.'s branch at Congress Junction, Arizona.

Bailey Meter Co., Cleveland, Ohio, has secured the services of E. A. Hitchcock as vice-president. Mr. Hitchcock will supervise the training of technical graduates for the company's service and sales departments. For the last six years he has been connected with the E. W. Clark & Co. Management Corporation as advisory, consulting and power-sales engineer. Previous to that time he was professor of experimental engineering at Ohio State University.

The Sullivan Machinery Co. announces the establishment of a new branch office at room 810 Park Bldg., Cleveland, Ohio, under the management of Ralph T. Stone, for several years sales engineer associated with the New York office. George H. Richey has been appointed New England sales manager, succeeding George Elmer Wolcott, who died on May 10. Mr. Richie was associated with Mr. Wolcott as sales engineer in New England and eastern Canada for several years.

Nash Engineering Company, South Norwalk, Conn., has issued an illustrated pamphlet, announcing that the name of "Hytor" will be applied to all Nash products hereafter, and will represent a hydroturbine type of compressor and vacuum pump for air and gas, vacuum or pressure. It is claimed that the "Hytor" will deliver air absolutely without pulsation. Various liquids may be used in the casing as the displacing medium which permits of handling acid gases, a liquid being adopted which protects and neutralizes the effect of the gas upon the metal.

F. H. Niles & Co., Inc., Woolworth Bldg., New York, announces the opening of a branch office at Bridgeport, Conn., Room 508, Security Bldg., 1115 Main St. The office will be in charge of F. H. Andrus, formerly with the Winchester Repeating Arms Co., of New Haven, and recently salvage expert in the War Department, Bridgeport District Ordnance office. The opening of this office is expected to facilitate the business of the company, not only in the regular lines, machine tools and foundry equipment, but also in new and old metals, both as to buying and selling. The main office is in New York, where the company has a seat on the New York Metal Exchange.

Trade Catalogs

Chain Drives. Morse Chain Co., Ithaca, N. Y. Pamphlet, 6 x 9; 12 pp.; illustrated, containing a reprinted article by J. S. White on "Chain Drives," in the 1919 year book of National Association of Cotton Manufacturers. The article is a short synopsis on the general subject.

Improved Impact Screen. Colorado Iron Works Co. Pamphlet No. 9C; 6 x 9; 24 pp.; illustrated. Descriptive of the improved impact screen for the wet or dry sizing of all kinds of materials, containing chapters on the construction, opera-

tion, adaptability, and installation of this company's screens. Table giving data on wire cloth, parts list and capacities are included.

Sprague Electric Dynamometers. Bulletin 48701-A; 8 x 10½; 12 pp.; illustrated. Descriptive of the Sprague electric dynamometers as applied to laboratory and production testing of gasoline and kerosene engines. Capacities of dynamometers furnished by the company are from one hp. to 1000 hp. Those described in bulletin are for a 50 hp. machine suitable for engines having a maximum torque of 50 to 200 ft.-lb. up to a 400 hp. machine for engines having a torque capacity of 800 to 1600 ft.-lb.

Boiler-Feed Control. Northern Equipment Co., Erie, Penn. Bulletin, 8½ x 11; 8 pp.; illustrated; embodying specifications for the Copes system of boiler-feed regulation. A cover is provided with punched holes for adding future bulletins or specifications. The following subjects are discussed: Principle of operation; heat storage; reduction of furnace temperature fluctuations and sudden load change; service performance; constant characteristic; thermostat; control valve; standard dimensions and drilling; and the Copes steam pump governor. The last page is devoted to a review of the company, and the history of boiler-feed regulation.

New Patents

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each.

Drilling—Rock-Drilling Machine. Gustaf Anderson, Stockholm, Sweden. (U. S. No. 1,300,100; Apr. 8, 1919.)

Electric Furnace and Transformer for Use Therewith. Frederick Edmund Berry, Hayes, England. (U. S. No. 1,299,664; Apr. 8, 1919.)

Excavator-Bucket Cleaner. Truls Loken, Kenosha, Wis., assignor to Frederick C. Austin, Chicago, Ill. (U. S. No. 1,298,978; Apr. 1, 1919.)

Filter Presses—Means for Indicating the Thickness of Cake Formation in Filter Presses. Daniel T. Nicholson, Visalia, Calif. (U. S. No. 1,299,946; Apr. 8, 1919.)

Flotation—Method of and Apparatus for Separating Minerals. Henry W. Allen, Earlysville, Va. (U. S. No. 1,301,532; Apr. 22, 1919.)

Flotation—Separation of Mixed Sulphide Ores. Rowland Thomas Dryll Williams, Broken Hill, N. S. W., Australia, assignor, by mesne assignments, to Minerals Separation North American Corporation. (U. S. No. 1,300,516; Apr. 15, 1919.)

Gas Producer. Erle Stafford Huntley, Friezland, Queensland, Australia, assignor to the Hampden Cloncurry Copper Mines Ltd., Melbourne, Australia. (U. S. No. 1,300,839; Apr. 15, 1919.)

Hoist—Mine-Cage Hoist. Thomas Price, Nanaimo, B. C. (U. S. No. 1,300,647; Apr. 15, 1919.)

Hoisting—Elevator. Walter O. Borcherdt,, Austinville, Va. (U. S. No. 1,297,992; Mar. 25, 1919.)

Ingot Molds—Teeming Ingot Molds. Emil Gathmann, Baltimore, Md. (U. S. No. 1,298,036; Mar. 25, 1919.)

Ingots—Process for Making Metal Ingots. Lewis B. Tebbetts, 2d, St. Louis, Mo. (U. S. No. 1,298,825; Apr. 1, 1919.)

Metal-Cleaning Apparatus. Abraham Hoyt Levy, New York, N. Y., assignor to Syracuse Smelting Works, Brooklyn, N. Y. (U. S. No. 1,298,229; Mar. 25, 1919.)

Mine Gate—Automatically Operated Mine Gate. Samuel W. Warman, Brownsville, Penn., assignor of one-third to Reuben M. Fry, Uniontown, Penn., and one-third to Charles Oppermann, Orient, Penn. (U. S. No. 1,299,074; Apr. 1, 1919.)

Mining-Car Coupling. Nicholas Mandabach, Vincennes, Ind. (U. S. No. 1,298,238; Mar. 25, 1919.)

Ore Loader. Sylvester H. Hunt, Bessemer, Mich. (U. S. No. 1,302,046; Apr. 29, 1919.)

Editorial Correspondence

SAN FRANCISCO—June 13

California Petroleum Production in April totaled 8,374,620 bbl., or a daily average of 279,154. Shipments from the field totaled 8,317,310 bbl. Crude oil stocks on Apr. 30 amounted to 32,543,145 bbl., an increase of 57,322 bbl. in the month. There were 8726 wells producing, including 40 new wells brought in. Drilling was started on 335 wells and 54 new rigs were installed. Only three wells were abandoned.

Comstock Northend Mines, at Virginia City, Nev., produced $13,700 from a total of 674 tons of ore treated at the Mexican mill, the mill running 92% of the time in week ended May 31. Consolidated Virginia sent to mill 193 tons of average value of $22.67 per ton. Ophir sent 481 tons, averaging $19.31 per ton. The mill shipped five bars of bullion to the San Francisco mint. The highest-grade ore in Consolidated Virginia was extracted from the 2100 level. Good milling ore was taken from all points mined. Prospecting on the 1800 level of the Ophir gave ore sampling $64.50 per ton. Conditions are good in other properties, prospecting and repairs being well advanced.

BAKER, ORE.—June 12

Homestead Mines Co. at Homestead is running mill of the Iron Dyke mine at full capacity. Iron Dyke is the largest copper producer in Oregon. The remarkable body of ore found in this mine has placed the district in the limelight. There will be a great deal of activity here this summer. Homestead is on the Snake River and is the terminus of the branch line of Oregon Short Line from Huntington. District extends from the Iron Dyke mine to the Seven Devils country, 40 to 45 miles long and 8 or 9 miles wide. Lack of transportation is holding back a number of promising properties further up Snake River. Some talk of railroad from Homestead down the river 135 miles to connect with Lewiston, Idaho. Principal orebodies are found along shear zones, usually when cut by intrusive dikes. Jerry Hayes, backed by Spokane capital, is extending a tunnel on the Copper Syndicate group. Operators in the Copper Queen group, on the Idaho side of the river, and four miles below Homestead, are hauling out and shipping some of their high-grade ore. Operators of the Olympic group, held under lease and bond by D. M. Drumheller, Jr., are now in 220 ft., crosscutting for a vein. The McCarty property, on Herman Creek, has opened up a large body of copper ore, and there is some talk of constructing a wagon road and putting in a concentrator. The White Swan mine, eight miles out of Baker, Ore., has been purchased by H. B. Smalley and E. Killfeather, of Spokane, who plan active development work.

WALLACE, IDAHO—June 12.

The Coeur d'Alene District, after 20 years of industrial peace, is again threatened with a strike in all mines, which, if called, will unquestionably result in closing down every mine in the district. The trouble of 1899, when the Bunker Hill & Sullivan mill was blown up, marked the end of the Western Federation of Miners in the Coeur d'Alenes. A few years later the International Union of Mine, Mill and Smelter Workers formed local unions in the district, but not until the last few months did the union show any vitality. Union men was employed in the mines, but most of the employees were non-union. Relations between the employers and employees were most cordial. But following the reduction of wages last March from $5.25 to $4.25, an active campaign was started to get the employees into the union. A few weeks ago the state organizer of the American Federation of Labor, with which the miners' union is affiliated, arrived and is still present. The mining companies advanced wages 50c. per day about a month ago, making the pay $4.75 per day, but this did not stop the steady increase in union membership, and it is now believed that at least 75% of the men are in the union. A communication has been addressed to the managers of the various mines requesting them to meet representatives of the union in conference to consider the following propositions: "The establishment of the eight-hour day in all departments of the industry in its true and actual meaning; a blanket increase in the schedule of pay of 50c. per day; an agreement to form a basis of relationship between employers and employees such as can be arranged in friendly conference." To this a signed reply was made by all the mining companies of the district in the form of a published statement addressed to "employees of the mines," in which they stated that they were adhering strictly to the eight-hour day; that the condition of the industry does not permit further increase in pay; that all the mines are operating on a narrow margin of profit and that some of them are actually operating at a loss; that the present rate of $4.75 per day is the same as the Butte scale and higher than the pay in Utah and and California. To the third proposition the mining companies replied as follows: "The third proposition is the old demand of the union for 'recognition.' It has always been the policy of the mines of the Coeur d'Alenes to operate on an 'open-shop' basis. No discrimination is made against union labor. But recognition of the union always means discrimination against non-union men; the union denying to the non-unionists the liberty of action which they so loudly claim for themselves. There will be no recognition of the union, and the mines will continue to operate on the open-shop basis." Upon the request of the union, the Department of Labor will send a representative to act as mediator between union and mining companies.

BUTTE, MONT.—June 13

The Anaconda Copper Mining Co. has under way a program for the fireproofing of all its 50-odd shafts in the Butte district, which will represent an outlay of about $2,000,000, the process consisting of "gunniting" a sort of lathe work attached to the wall plates of the shaft, permitting easy access to the timbers in the event of it being necessary to realign the shaft. Cement guns have a considerable utility in the equipment of the larger mines, and an increase of their use generally throughout the district appears to be indicated.

SALT LAKE CITY—June 14

The Park City Strike, after lasting about five weeks, has reached a stage where the miners are moderating their demands. The men are now asking an increase of 75c. a day in wages and an eight-hour shift "from collar to collar" and no discrimination against the men who have been out, as compared to the original demand of an increase of $1 per day and a six-hour shift. June 15 has been set by them as a time limit for the receipt of an answer from the operators, after which, if their demands are not complied with, they threaten to declare the strike permanent. There is a desire on the part of many of the men to return to work, and the conservative element made itself felt so as to gain a modification of the demands, although it was not strong enough apparently to call off the strike. It is apparent, however, that a large number are tired of the strike. It is not probable that the owners will treat with the men unless they agree to return to work under conditions prevailing before the strike was called.

PHOENIX, ARIZ.—June 13

A Strike of Linemen and Operators on the 17,000-kw. hydro-electric system of the Salt River Valley Water Users' Association for a while cut off Inspiration power supply from Roosevelt. It made little difference, as the reverberatories of

the Miami smeltery furnish enough steam for camp uses at the present diminished rate of production.

Attorney General W. E. Jones has decided that the time taken by miners in eating their noonday meal should be included within the eight-hour work day, from collar to collar, unless the meal should be eaten above ground, the latter contingency affecting only the smaller mines.

Directors of the Arizona Chapter, American Mining Congress, met in Phoenix on June 6 to consider certain subjects affecting the mining industry of the state, this meeting being preliminary to the one to be held by the directors of the chapter, at the Saint Francis Hotel, in San Francisco, on June 27. Directors of the chapter are all representative mining operators of Arizona. Norman Carmichael, general manager of the Arizona Copper Co., Ltd., at Clifton, Ariz., governor of the chapter, presided at the meeting.

OURAY, COLO.—June 12

In the Ouray District of Colorado several new developments and improvements are under way. The Mountain Top Mining Co. is mining high-grade ore from its Terrible vein and is planning to increase mill output. The Chipeta M., M. and S. Co. is opening El Mahdi mine and putting in air-drill equipment, besides driving a crosscut on the H. A. C. property. The Atlas M. and M. Co., at Sneffels P. O., is planning enlarged mine development and increased mill output, under new local management. Fred Carroll, State Commissioner of Mines, who organized this property and company some years ago, has resigned his state position and returned to the management of the mines, succeeding James A. Lannon. The property covers some of the best veins in the Camp Bird-Tomboy-Revenue district and has yielded a large tonnage of low-grade silver-lead ore through the Atlas mill. There is much undeveloped ground in thes Klondyke vein, which will be opened up in the near future. The mill tonnage has fallen lower than the average, but it is expected that this will be brought back and possibly some selective flotation practised, to recover the lead and silver together and throw the zinc into a separate concentrate. The Atlas mill is well known as having been practically the pioneer, in the United States, in employing cold, non-acid flotation; also for its uniform recovery of over 90% of both the lead and the silver, over a period of some years. Construction a few years ago left room in the building for additions to plant, which may installed later this season.

FORT WORTH, TEX.—June 4

General Strike in Oil Fields of north Texas may be called, it is reported here, on account of order issued by Texas Producing Co. discharging all men who joined the International Oil Field, Gas Well and Refinery Workers' Union.

BATESVILLE, ARK.—June 12

Claims Filed by Manganese Operators in the Batesville field of Arkansas have recently been investigated by a committee of three representing the War-Minerals Relief Commission. The three members of the commission investigating this field are Fred. P. Williams, engineer, and Guy L. Langton and William H. Dunn, accountants. The Relief Commission was scheduled to arrive in Little Rock, Ark., on June 19. It is expected that the field men will require several weeks to complete their work.

JOPLIN, MO., June 12

Consolidation of Mines is one of the developments that is confidently expected in this district as a result of the poor zinc-ore prices, and one instance has just been recorded. The Blue Bonnet mine, at Hockerville; the Beck mine, at Picher, and the Silver Plume, near Treece, Kan., and the Central, near Tar River, Okla., have been consolidated under one ownership. Walter H. Logan will have the management of properties. He has been manager of the Blue Bonnet, which has become one of the best producers in the field in the last few months. The Blue Mound mine also has taken over the Lucky Strike property, south of St. Louis, Okla., and will develop it. Other combinations and consolidations are rumored.

Construction of a Third Concentrator is being begun by the Union Metal Mines Co., on its lease near Waco, Mo. The new mill, which will be known as the No. 3, will have a capacity of at least 1000 tons in 20 hours, and probably will exceed this. It will be equipped with a mixed pressure turbine, the first one to be used in the district. Three shafts are already down to ore on the company's lease, where No. 3 mill will be built, which is on the Kansas side of the line, opposite No. 2, which is in Missouri. Completion of the mill is not expected by the manager, P. B. Butler, of Joplin, before Oct. 1, or possibly Jan. 1 next.

DULUTH, MINN.—June 12

Iron-Ore Shipments from the head of the Lakes, as of June 1, show a falling off of 645,676 tons, as compared with the 1918 season. The lead which 1919 achieved over 1918 by virtue of the early opening of navigation has been more than offset by the lassitude of the independent shippers, but it is confidently reported that these will start in increasing volume after July 1, and there are numerous indications for an uncommonly heavy movement during the last half of the season. Shipments to June 1 compared with last year follow, in tons:

	1918	1919
D. M. & N., Duluth.....	3,111,843	3,751,336
G. N., Superior.....	1,815,322	1,113,617
Soo, Superior.....	237,892	159,648
D. & I. R., Two Harbors..	1,669,043	1,300,292
N. P., Superior.....	134,371	79,047
C. & N. W., Ashland.....	741,398	733,649
Soo, Ashland.....	156,753	83,357
Totals.....	7,866,622	7,220,946

MARQUETTE, MICH.—June 14

Iron-Ore Shipments from the Marquette Range have not thus far during the season approached the figures reached during either of last two years. During May, 151,749 tons was shipped from Marquette, but it is believed that shipments from the mines will be on a normal basis before the close of the season, and there are now more steam shovels loading from the stockpiles.

In the Gwinn district progress is being made in dewatering the Stephenson mine, which was flooded about a year and a half ago. Two Lane and Bowler, eight-stage, electrically driven pumps have been installed at this property. One of these is suspended to a depth of 300 ft. and the other 500 ft., and each is pumping about 1800 gal. per min. The installation includes several interesting features.

The 2500-cu.ft., electrically driven, direct-connected, Type P. R. E. No. 2 air compressors have been installed and are in operation at the Cliffs Shaft mine and one air compressor is in operation at the Lake mine, Ishpeming. Similar installations, one each, are being made at the Negaunee and Maas mines, Negaunee. The Cleveland-Cliffs Iron Co., the largest operator on the Marquette Range, has been conducting considerable exploration north of Ishpeming. The Lake Angeline mine, at Ishpeming, has been reopened for the season and is conducting underground and surface work, the later consisting of scramming and cleaning out of small orebodies. The South Jackson mine, Negaunee, has been reopened and ore is now being loaded from the pit by means of a steam shovel. William Nichols is in actual charge of operations. Underground work began at Rolling Mill mine, recently acquired by Clement K. Quinn and associates, on June 16. Ralph S. Archibald is manager, Alfred Piper mining captain, and Guy Neault in charge of surface operations.

In the Palmer district, the Empire mine, F. D. Klinglund, superintendent, is exploring, by means of test pits, an adjoining property, and is also conducting underground operations in a small way. The Maitland and Isabella mines are operating and shipping.

The Republic mine, at Republic, is just completing the installation of a new hoisting plant at its No. 9 shaft. The hoisting drum is 12-ft. diameter and has a capacity for 4600 ft. of 1¼-in. rope. Power is furnished by two 500 hp. G. E. motors. The shaft is vertical and is 2400 ft. in depth. A storage-battery locomotive has recently been placed on the 2400 level, and its use is proving most satisfactory. It is reported that the Williams Iron Co. is planning to do some diamond drilling on its property near Humbolt.

HOUGHTON, MICH.—June 14

Quincy's General Underground Conditions are showing maintenance of quality. In 1918, the average output was 16.99 lb. per ton, refined copper. Now it is running 20 lb. The betterment has been steady from the first of the year. In April it was a fraction over 17 lb. Production has decreased 20%, normal tonnage being 100,000 per month, but the average physical contents of copper is bettering steadily.

A contributing factor to the betterment in copper contents is the increase in efficiency of underground employees. More experienced miners are now at work than it was possible to secure a year ago. The demarcation between the mineralized amygdaloid lode and the barren trap rock is not distinct. The formations blend one into the other, so that it requires capable miners to avoid sending poor rock to the surface.

Quincy is now operating on six different branches of the Pewabic lode, the mineralization being practically the same on all. The amount of mass and barrel work is up to standard and comes from all sources. Opening and development work is going forward at the rate of 2000 ft. a month and is keeping about two years ahead of the stopes. The mine now has better than nine miles of ground opened, altogether. Last year 24,580 ft. in all of new openings was made. Two of the Pewabic lode branches are continuing to show a considerable amount of silver. Last year there was a total profit of $54,580 from this source.

No. 2 shaft, of the three operating shafts, continues to produce the largest tonnage of rock for the stamp mill, as well as the largest amount of copper. This, despite the fact that the ore is leaner than that from No. 6. No. 2 secures more mass copper than any other. The ground in the lower openings, particularly to the north, is heavy with it. More recent openings show a larger total of mass, a condition which is rather out of the ordinary at greater depth. The Mesnard shaft, designated officially as No. 8, is not as deep as the others and has not been as high in copper contents as they have. There has been, however, a slight change in general appearance in practically every new opening in this shaft.

VICTORIA, B. C.—June 13

The Position of Dolly Varden Mining Co. is still occupying attention in mining circles in British Columbia. Notification was received by the British Columbia government from Ottawa to the effect that a petition had been submitted there asking for the disallowance of the provincial legislation under which the Taylor Engineering Co. is taking over and proposes operating the Dolly Varden company's property at Alice Arm. This was done, it is understood from authoritative quarters, at the instigation of George Wingfield, Reno, Nev., in whose name there stands a mortgage against the mine amounting to $150,000. It is understood that as soon as it was realized that the property was required by the recent statutes to pass to the control and ownership of the Taylor Engineering Co., in default of settlement in cash of its claims against the mining corporation, Mr. Wingfield took the course indicated ,with a view to obtaining adequate protection for his mortgage. Apparently having been satisfied in the meantime that his investment under the new conditions was in no way jeopardized, Mr. Wingfield has caused the petition for disallowance to be recalled. It therefore would appear that there is no likelihood of the provincial government's legislation being questioned from Ottawa, and the Taylor Engineering Co. is free to proceed with its plans for the opening up and the placing upon a producing basis of the Alice Arm property.

TORONTO, ONT.—June 13

Mine Workers of Kirkland Lake Camp to the number of about 360 went out on strike on June 12. The mining companies refused to grant the demand made by the men for a 44-hour week, underground wage of not less than $4.50 per day, and recognition of the union. The mines are not at present making any endeavor to operate. Large numbers of the miners have left the camp. It is not believed that the strike will spread, as Porcupine miners have declared against a strike, and the attitude of the Cobalt mine workers at last accounts was stated to be conciliatory.

Salt Deposits Along the Athabasca River have been investigated by J. L. Coté, provincial secretary of Alberta, and Prof. J. A. Allan, of the University of Alberta, with a view to their commercial development. Drillings 540 ft. deep at Fort McMurray were inspected. Numerous saline springs have been discovered in this vicinity, but these in every case occurred at considerable depth. An examination was also made of the bituminous lands along the Athabasca, the industrial development of which is understood to be dependent on investigations now in progress at McGill University, Montreal.

The Mining News

ARIZONA

Cochise County

BORAS LEASING (Bisbee)—Exploration on 310 level has opened gold-silver body, from which three cars have already been shipped to Douglas reduction works. Will sink to 450 level, and crosscut to new orebody. L. R. Bailey, manager.

NIGHT HAWK LEASING (Bisbee)—Encouraged by finding commercial copper ore in 125-ft. winze sunk from 500 level, company plans immediately to extend shaft from 575 to 700 ft. Superintendent McKenna gone to El Paso and Denver to purchase hoisting machinery.

SHATTUCK-ARIZONA (Bisbee)—Have made some alterations in milling plant and will conduct some experiments during June and July looking to greater recoveries. Production not yet resumed. Water pumped into mine at time of fire, filling it to within five feet of 700 level. Pumping stopped last month. Water seeping away at rate of 8 in. per day, and on June 10 had fallen to within 21 ft. of 700 level. Fire thought to be out, but water will be permitted to remain 30 days longer.

HILLTOP M. AND S. (Hilltop)—Continuing development in three tunnels which cut orebodies at 750, 1050, and 1350 ft. respectively. Will install concentrator.

Greenlee County

ARIZONA COPPER (Clifton)—No. 6 shaft retimbered and equipped with water spray system.

Mohave County

CARR (Kingman)—To be operated by local leasing company, headed by R. C. Jacobson. Property in Cedar Valley district.

CYCLOPIC (Kingman)—Mill being enlarged to 150 tons' daily capacity. Thomas Bell, owner, in charge.

RURAL-BUCKEYE (Kingman) — Old Mineral Park properties taken over by M. B. Dudley and New York associates, who will build 100-ton mill. Large tonnage silver ore already available in stopes and on dumps. Main owners, with Dudley, are G. C. Buschenes, Samuel Weil, S. I. Rabinovich, and Milton Gross. Mines five miles from Chloride railroad and one-half mile from electric power line.

ARIZONA MOSSBACK (Oatman)—To start work in July on large mill. Shaft nearing 700 level. Stations to be cut at 600 and 700 ft. and vein explored on those levels. Ample ore for mill said to have been developed on 500 and above.

UNITED EASTERN (Oatman)—Main shaft down about 1400 ft. in sinking to cut ledge on dip. Tom Reed has 1450 ft. depth and Gold Road 1500.

Pima County

YELLOW BIRD (Tucson)—Company formed to take over old silver properties of Lincoln camp, in Papago district. W. E. Fuller, assistant cashier of Tucson National Bank elected treasurer; Deputy U. S. Marshal James M. Treahy, trustee.

Pinal County

RAY BROKEN-HILL (Ray)—Long tunnel from Mineral Creek level has broken into oxidized zone at point 450 ft. below collar of shaft, tapping large flow of water. Property lies short distance below Ray.

Yavapai County

GRAND ISLAND (Jerome)—Management announces property will soon be prospected by diamond drill. Negotiations for drilling contract under way with International Drilling Co., of San Francisco.

UNITED VERDE EXTENSION (Jerome)—Production resumed at blast furnace at Verde, expected to be standard at 3,500,000 lb. a month till market conditions better for copper. Work at mine restricted by lack of good miners. Haulage tunnel construction to be completed within 60 days.

FRANCO-AMERICAN (Mayer)—Former Governor Oddie of Nevada and Senator Gorman, of West Virginia, principals in developing company. Situated two miles from Stoddard and eight miles from Mayer.

ARKANSAS

Boone County

GLORIA (Zinc)—Force of miners reduced to four men. Mill will not be operated until market rises. Large tonnage already blocked out.

RHODES-MANCHESTER (Zinc)—McCurry Mining and Milling Co., operating Rhodes-Manchester zinc mine, will complete new 100-ton concentrating plant on property this month.

Marion County

LONNIE BOY (Rush) — Development work, which has been in progress since last Autumn, has been discontinued. Three tunnels, 45, 75, and 200 ft. long, respectively, have been driven into body of high-grade zinc carbonate 14 to 16 ft. thick. Stanley Hanford, one of the owners, states ore sufficient to produce 5000 tons of hand-cobbed ore and concentrates has been blocked out. Three carloads of hand-cobbed ore are in bins ready for shipment, much running as high as 53% metallic zinc. As soon as market warrants concentrator will be erected.

CALIFORNIA

Alameda County

WRIGHT MANGANESE (Livermore)—G. W. Gardner, of San Jose, Calif., awarded $44,000 in claim against W. A. Wright. This is half interest in profits derived from sale of manganese during period of war.

Amador County

CENTRAL EUREKA (Sutter Creek)—Milling ore being drawn from 3500 and 3600 levels. Sinking of main shaft to 3700 level now in progress.

OLD EUREKA (Sutter Creek)—Station cut on 3000-ft. level, from which development work north and south of shaft will continue.

Butte County

BAUXITE (Oroville)—Chamber of Commerce investigating possibility of manufacture of aluminum. Large deposits of bauxite and power available at price attractive to aluminum manufacturers.

Inyo County

DARWIN DISTRICT improving since advance in price of silver. Rip Van Winkle mine, adjoining Defiance, has struck good orebody. Wallace mine has several men employed. Lucky Jim producing regularly. Whole Darwin district shows prospect of good season.

Nevada County

MORANDI (Grass Valley)—Ledge recently uncovered by crew employed in state highway work, crossing between Morandi place and Ben Franklin mine.

SOUTH STAR (Grass Valley)—Development work on high-grade ore recently discovered shows commercial values to be continuous in vein averaging 4 ft. in width.

CLEVELAND (Sierra City)—Mill capacity to be doubled by adding 10 stamps. R. G. Gillespie, owner, and S. E. Montgomery, manager.

GASTON (Washington)—Surface plant, including 30-stamp mill, destroyed by fire on June 3.

Shasta County

GARFIELD (Redding)—Garfield mine, formerly large producer, optioned by Garfield Mining Co., and adjoining claims acquired. Permitted by State Corporation Department to issue stock.

Siskiyou County

FORKS OF SALMON RIVER (Forks of Salmon)—Ten men at work. Running three No. 5 giants with 6-in. nozzles. Elevator, 18-in. opening, installed. About 3000 inches carried in main flume and 2000 inches in lead water flume. Head in pit 235 ft. Largest operating mine in district since La Grange shut down. Capt. John D. Hubbard in charge.

Trinidad County

LA GRANGE HYDRAULIC MINE (Weaverville)—Orders received by management to close property indefinitely. Reported company found it impossible to operate profitably under heavy burden imposed by war exigencies, including 30% tax imposed by British government. Company largely composed of British investors, subject to taxes levied from London.

COLORADO

Boulder County

COLORADO METALS (Magnolia)—Has acquired Senator Hale group of properties, and is installing mining machinery preparatory to active development.

BOND SYNDICATE LEASING (Ward)—Remodeling Strong mill for treatment of low-grade milling ores from district. M. W. Loomis manager.

Clear Creek County

CHICAGO BELLE (Dumont)—Acquired by Bonanza Mines Co., recently organized with following officers and directors: George W. Taylor, president; C. L. Jaynes, Idaho Springs, vice-president, and manager; B. D. Arbuckle, treasurer; C. E. Angell, secretary; Frank Heilig and A. E. Gees. A force of men is employed in placing property in condition preparatory to general development campaign.

Gilpin County

FULLER-MacCULLOGH CO. (Russel Gulch)—Has acquired considerable mining property recently, and is planning to operate Becky Sharp, Iron, Pewabic, Old Town, and Silver Dollar properties. At present company is shipping 25 tons of ore per day and expects to increase production to 100 tons by Sept. 1. Unwatering operations in progress, and underground workings in Old Town, Pewabic, and Iron Mines being repaired preparatory to active development. J. Gillingham Hibbs, consulting engineer.

IDAHO

Shoshone County

YUKON GOLD (Murray)—Dredge operating on Prichard Creek closed down two weeks for repairs, being first time lost on this account in last year.

BLACK BEAR (Wallace)—New directors announce work will begin about July 1 after being idle many years. Much lead-zinc ore in sight, and company expects to begin shipping soon after starting. Negotiating to lease mill.

ST. LAWRENCE (Saltese, Mont.)—Fifteen men employed on development. Raise completed from lower to upper tunnel, 200 ft., and drift from raise in good ore. Also raising to catch oreshoot 200 ft. east. Property six miles from railroad. Hauling and freight cost prohibit shipping.

TARBOX (Saltese, Mont.)—Richard Daxon, manager, now in East making financial arrangements for construction of mill. Large body of lead-zinc ore developed on three levels.

KANSAS

Joplin District

KING-BRAND (Baxter, Kan.)—New mill completed. Air drifts between two shafts cut. Operations to start at once.

SILVER PLUME (Baxter)—Has just installed engine in mill completed some weeks ago, and will start operating June 15.

WAUCHUSETTS (Commerce, Okla.)—After making record production with five hand jigs, company has purchased mill. A. Mayerhoff, Commerce, Okla., manager.

MICHIGAN

Copper District

CALUMET & HECLA (Calumet)—Big dredge in operation, after having been overhauled in drydock at Point Mills. Revolving screen removed. Grinding and leaching plants doing full duty, and oil flotation in connection therewith will be in operation in three months. Calumet & Hecla output down to 50% basis. Thirteen stamp heads out of 28 running at mills, handling conglomerate exclusively. Small tonnage from Osceola amygdaloid comes from necessary shipments of rock taken in openings. But 14 furnaces work-

ing at smeltery. Only construction in progress is erection of steel work for flotation plant at mills. When this plant is working all conglomerate slimes will be either floated or leached.

MOHAWK (Mohawk)—Now has in operation two four-ton trolley locomotives in No. 4 shaft and two in No. 6, in addition to two endless-rope haulages in No. 6. During 1918 number of raises decreased below normal, discrepancy being explained on basis of large number of chutes needed to serve new-style haulage. There was general remodeling of mine cars and considerable car construction. All Mohawk shafts now furnished with concrete collars and stringers, No. 1 being last to receive them. Water pipe from surface to 18th level installed at No. 5 shaft. Pump from No. 2 at 20th level overhauled, and now running at No. 5 on 18th level. Draining from No. 2 handled by electric pumps from No. 1.

Marquette Range

ROLLING MILL (Negaunee) — Operations began June 16 at full capacity by Clement K. Quinn & Co., which recently took over lease of property from Jones & Laughlin Co. Crew of 100 miners put to work under William Piper, who recently came here from Alpha, Michigan.

MINNESOTA

Vermilion Range

ZENITH (Ely)—Ownership of lease on Zenith passes from Oliver Iron Mining Co. to Zenith Iron Mining Co., which will operate property. New company organized by T. F. Cole, R. B. Whiteside, R. M. Sellwood and Frank A. Kent, who also control fee of property. New lease runs for 50 years, minimum for 1919 to be 200,000 tons, and 300,000 tons for each year thereafter, royalty to be 20% of Lake Erie selling price. Zenith produces high-grade bessemer ore of excellent structure. Estimated there are over 1,000,000 tons immediately available.

MISSOURI

Joplin District

SILICATE MINING (Topeka, Kan.)—Has purchased 150-ton mill, and will erect at lease in Corry field, near Greenfield, Mo. H. E. Reicherter superintendent.

MONTANA

Beaverhead County

BOSTON & MONTANA (Wise River)—Crosscutting from upper Idanha tunnel under way. Ore showing strong in Idanha fissure in this working. Expect to cut Central, Elkhorn, and Park veins within 90 days, and Elkhorn, nearest vein, within month. Largest trestle of Montana Southern Ry., subsidiary, completed last week, and rail laying in full swing, with rapid progress being made.

Cascade County

CASCADE SILVER (Neihart)—Mill recovery running low, with tailings high, and a conflict has arisen with state game warden department over polluting of stream with tailings. Director P. A. Gow, of Butte, has instituted suit in District Court against president, George Brabrook, and vice-president, H. L. Maury, and other officials to compel restitution to treasury of 150,000 shares, voted by officers to themselves for "services rendered."

Missoula County

POTOMAC COPPER (Potomac)—Road construction nearing completion and transportation of air-compressing machinery will be started within several weeks. Tunnel will be driven to open old "Copper Cliff" at depth of about 800 ft. and fissure system higher up mountain side at depth of 1200 feet.

Silver Bow County

ANACONDA (Butte)—Shaft of Orphan Girl mine will be sunk from 500 to 1000 ft. and Orphan Girl, Orphan Boy, and Anglo-Saxon fissures opened at that depth. Orebody 35 ft. wide on 500 level of Anglo-Saxon vein continuing. Showing good on Orphan Girl vein on 500 level. On Orphan Boy fissure 2½ ft. ore. Pilot-Butte mine's showing one of best in district. Twenty-eight hundred level of Stewart continues in first-class ore, shaft being sunk to 3400 level. Company hampered by lack of skilled miners, and, during enforced suspension of Diamond mine, shaft will be concreted. New stack at Washoe smeltery put into full operation, together with Cottrell smoke-treating plant, which estimated will add 1% to metal recovery of reduction works.

BUTTE & SUPERIOR (Butte)—No. 2 shaft raised from 2050 level to 1900 about completed, and its sinking will start soon for 2500 level. Mill recovery for May, 97%, one of record months.

CRYSTAL COPPER (Butte)—Five feet of ore cut in North vein on 500 level of medium grade. Two-foot high-grade stringer opened about 30 ft. away and apparently heading into larger oreshoot. Development work started on fissure to south, showing more than 6 ft. of mineralized quartz.

ELM ORLU (Butte)—Shaft sinking continuing. Station will be cut at 2500 level and Rainbow fissure crosscut. Objective of shaft is 3000 level.

TUOLUMNE (Butte)—Cutting of station at 1000 level of Sinbad shaft of Main-Range mine to begin within 10 days, and crosscutting for Spread Delight fissure at this depth within two weeks. Estimated vein distant about 700 ft. and will be reached about last of August. Sinking to be pushed simultaneously with crosscutting.

NEVADA

Lincoln County

HARNEY (Pioche)—Suit filed against Nevada Volcano Mines Co., owner of Harney group of claims, by Lloyd brothers, of Pioche, to recover possession of European claim, located by Lloyd brothers on Jan. 1, 1915, and subsequently relocated and patented by Thomas Harney, who asserts Lloyd brothers failed to perform location work. Lloyd brothers claim never to have yielded title and that patent was obtained without their knowledge. Claim of considerable value, through strike of high-grade silver-lead ore thereon six months ago by Stindt & Donohue, leasing from Harney. Subsequent production of claim to date about $75,000.

PIOCHE MINES (Pioche)—Shipping ore to Southern Nevada mill for concentration. Milling operations hampered by water shortage.

PRINCE CONSOLIDATED (Pioche)—Moving all machinery from old incline shaft and installing at new vertical shaft completed last year. Old incline shaft to be abandoned to permit mining of shaft pillar, containing large tonnage of iron-manganese ore.

VICTORIA-NEVADA (Pioche)—Commenced operations on Donohue group of claims, adjoining Poorman mine, and will explore extension of Poorman veins.

NEW MEXICO

Grant County

REPUBLIC M. AND M. (Hanover)—Annual report shows net earnings $52,000 for 1918, and a total of 44,000 tons ore blocked out and 6000 tons 20% zinc ore on dumps; and 500,000 tons iron ore is indicated, assay 58% Fe. Orebody is contact between porphyry and garnet silicates. Ira L. Wright, engineer.

LAST CHANCE (Lordsburg)—Has cut 14 ft. ore on 200 level. Working mill half shift, because of water scarcity.

VIOLA (Lordsburg)—Pyramid Mining Co. has completed unwatering of 408-ft. main shaft and has cut 9 ft. silver ore on 300 level. Will begin development work on lower level at once. B. Prescott manager.

OKLAHOMA

Miami District

GOLDEN ROD M. AND S. (Joplin)—Has purchased Dallas-Picher mill on one of its leases, and is razing it. Company's No. 4 mill being enlarged to handle 1500 tons in 24 hours. Surface railroads will haul dirt from No. 6 and from Dallas-Picher tract to No. 4.

LADD (Picher)—Has purchased Scott-Eagle mill, near Quapaw, and will move it to lease two miles north, not far from Picher.

ALAMO (Quapaw) — Has purchased Lucky Bob mill and lease north of Quapaw, and will operate it.

SOUTH DAKOTA

Lawrence County

IRON HILL (Carbonate) — Fire destroyed shafthouse and equipment. Plant has been used by contractor, who is driving 1350 ft. tunnel to tap lower workings. Electric power line will be extended to portal and motor-driven compressor installed. Tunnel advanced 500 feet.

HOMESTAKE (Lead) — Ellison shaft, now down 2090 ft., including sump, being deepened. Next level will be opened at 2150 ft. Storage for 10,000 tons of bituminous coal completed. Coal removed from open bin by means of ¾-yd. Erie clamshell shovel.

Pennington County

SUMMIT (Hill City)—Preparations being made to resume. Mine will be unwatered and active development started soon. New boilers being installed. James Graham in charge of work.

UTAH

Summit County

SILVER KING COALITION (Park City)—Re-hearing in suit with Conkling company over ore alleged wrongfully extracted refused by District Court of Appeals sitting at St. Louis. Appeal to U. S. Supreme Court probable. Conkling company awarded about $500,000.

TEXAS

Brazoria County

WEST COLUMBIA FIELD PRODUCTION for first week in June was 30,900 bbl. per day, compared with 17,000 bbl. three weeks ago. Producers are: Texas Co., 10,000 bbl.; Gulf Production Co., 8050 bbl.; Humble Oil and Refining Co., 7550 bbl.; Crown Oil and Refining Co., 4700 bbl.; Sun Oil Co., 600 bbl.

HUMBLE OIL AND REFINING (West Columbia)—Waters No. 1 well, brought in June 3, making 3000 bbl. from depth of 3380 ft. Best well of week reported from south Texas.

GULF PRODUCTION CO. (West Columbia)—Phoenix No. 1 flowing by heads about 1000 bbl. per day from 2300 ft.; Phoenix No. 2 flowing 200 bbl. from depth of 1850 ft., but showing signs of sanding up; Eyers No. 5 well, brought in June 5, flowing 150 bbl. from 3200 ft.

Eastland County

PRAIRIE OIL AND GAS (Eastland)—Slayden No. 3 well, on Arenbeck survey No. 2, brought in recently, with production of 500 bbl. from 3440 ft. Slayden No. 7 well, on same survey, making about same production from that depth. Terrell well, on Arenbeck survey No. 1, making 80 bbl. from 2441 ft. Other wells producing in this district: Golson, Moorman & Co. brought in well June 2 on Harrison tract of York survey, making good production from 3440 ft.; Hupp & Perkins No. 1 well making top showing of 300 bbl., with 150 ft. to go to Ranger sand. This well offsets Ballentine's Pleasant Grove Church well, and is five miles north of Eastland.

SINCLAIR GULF (Ranger)—J. E. Barns well, three and one-half miles west of here, making 1,500,000 ft. of gas from depth of 3410 ft.

Hardin County

SUN OIL (Saratoga)—Brought in 100-bbl. gusher in eastern part of field at depth of 2000 ft. Expected strike will increase activity here.

T. H. Y. CO. (Sour Lake)—Well brought in June 1 on Lucy Moore lease in old "Shoestring" field, making 50 bbl. at 850 ft., with indications of improving. Company local organization.

Harris County

SOUTHLAND OIL (Humble)—Hirsch No. 11 well abandoned at 1250 ft.

PETROLEUM REFINING (Humble)—Stevens No. 15 well brought in as 100-bbl. pumper.

TEXAS CO. (Humble)—Landslide No. 236 well has come in at 3000 ft., producing 1500 bbl., according to official statement.

Lampasas County

CONSIDERABLE DRILLING now in progress; Howell well No. 1, on White ranch, has good showing of oil at 1030 ft. Standard rig, new boiler and engine being installed. Robert well No. 1, on Conradt ranch, north of Lometa, has good showing at 1070 ft.; setting casing. Key well No. 1, on Baxter ranch, drilling in dark limestone of Bend formation, reported some oil showings. Nelms-Marmion No. 2, on McCrea ranch, Groves No. 2, and St. Mary's No. 1, on Le Compte ranch, all drilling.

Liberty County

GULF PRODUCTION (Hull)—Phoenix No. 2, that came in flowing 300 bbl., has sanded and now making only 80 bbl.

The Market Report

SILVER AND STERLING EXCHANGE

June	Sterling Exchange	Silver New York, Cents	Silver London, Pence	June	Sterling Exchange	Silver New York, Cents	Silver London, Pence
12	4.6100	112⅛	54⅛	16	4.6075	112⅛	54⅛
13	4.6113	110⅜	54	17	4.6050	112⅜	54⅛
14	4.6075	111⅛	54⅛	18	4.6113	112⅛	54⅛

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

June	Copper Electrolytic	Tin †Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
12	17.60	72½	5⅛ @5.40	5.10 @5.15	6.50 @6.60
	17.75		5⅛	5.10	6.55
13	@17.85	72½	@5.40	@5.15	@6.65
	17⅞		5⅛	5.10	6.50
14	@17⅞	72½	@5.40	@5.15	@6.55
	17⅞		5⅛	5.00	6.50
16	@17⅞	72½	@5.40	@5.10	@6.55
	17.55		5.35	5.00	6.50
17	@17.65	72½	@5.40	@5.05	@6.55
			5.35	5.00	6.45
18	17.60	72½	@5.40	@5.05	@6.50

† Government price.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other special shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

LONDON

June	Copper Standard Spot	Copper Standard 3 M.	Copper Electrolytic	Tin Spot	Tin 3 M.	Lead Spot	Lead 3 M.	Zinc Spot
12	80	80½	83½	237	233½	22½	22⅝	36½
13	81½	82½	85½	238	235	22⅝	23	36½
14	....	....	....	....	....	....	....	....
16	83	83½	86	241½	237½	23⅛	23⅜	36½
17	82½	83	86	240	235½	22⅝	23⅛	36½
18	84	84½	86½	242½	238	22⅝	23⅛	36½

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb.

Metal Markets

NEW YORK—June 18, 1919

The metal markets were quiet and irregular during the last week, being more or less disturbed by the ups and downs of the stock market. The strike at important copper-manufacturing centers and the fear of labor troubles in Western mining districts were disturbing factors.

Transatlantic freights have become easier, it being now possible to get rates of $16 per 2000 lb. to British ports. The rate from Pacific ports to Hongkong and Kobe remains at $14.

The stocks of metals in the hands of the British Ministry of Munitions on June 1, with the corresponding figures for May 1 in parentheses, were as follows: Copper, 107,502,080 lb. (114,531,200); lead, 134,295 short tons (122,093); zinc, 43,039 short tons (38,045); aluminum, 12 229 short tons (12,927); nickel, 7,956,480 lb. (5,750,080); antimony, 5040 short tons (4996). The increase in lead and zinc stocks was of course due to arrivals of metal previously held elsewhere.

Copper—Demand was light during most of the week. This was but natural, in view of the large business which previously had been done, while the labor troubles at some important copper-manufacturing centers naturally checked inquiries. Rome and Ansonia have been completely tied up, and yesterday the trouble spread to Waterbury, and there were reports this morning that all of the plants there had been closed. On June 12 the market was very firm on the basis of 17.60c., cash New York, or 17⅞c., delivered, regular terms. On June 13 some of the large producers raised their price by ¼c. and booked some small business at the advance. With the reaction in the stock market and the absence of inquiries from manufacturers some speculative and other interests offered copper more cheaply and accepted some small business at relatively low prices on June 14 and 16. On June 17 there was some substantial inquiry from wire-drawers, who took some round lots on the basis of about 17.60c., New York, and today the market was steady at that price, with some of the larger producers holding for higher prices.

Copper Sheets—The base price of copper sheets is 24c. per lb. Copper wire is quoted at 20½@20¾c. in carload lots, f.o.b. mill.

Tin—The unsold tin in the hands of the U. S. Steel Products Co. on June 9 was 1071 tons. Sales from June 9 to 14 were 494 tons. Balance unsold on June 16 was 577 tons. The War Trade Board under date of June 16 announced that import restrictions would be removed and that licenses to import pig tin would be granted subject to the following conditions and limitations: Importation only of shipments made from points of origin on or after June 30, 1919. Such import licenses will not be valid for entry until Aug. 1, 1919. It seems probable that the allocated tin will be fully placed before the end of June. It is to be inferred from the dates fixed by the War Trade Board that the American smelters are to have a month in which to market their stocks of tin, which heretofore they have had to hold. In the meanwhile, there is gossip that surreptitious business in tin has been going on.

Lead—A fair business was done during the week, the major part of which was at the full price, but here and there some shading was done, and toward the close the market seemed to be a little softer. Such weakness as was exhibited was due mainly to the offerings of speculative interests, the principal producers being in a very strong statistical position, and being very firm in their ideas. The imposition by the Canadian government of a duty of 1c. per lb. on imports of lead into Canada has created some concern among the producers of Mexican lead. Japan was again a buyer of lead this week.

Zinc—On speculative buying the advance in this market continued, but upon its cessation the market became easier. A moderate business with consumers was done in brass special and high-grade intermediate spelter. Advices from Europe are to the effect that the Belgian smelters have made a large contract for Australian ore and are preparing to resume smelting soon, but in view of the high cost of both ore and coal, especially the latter, it is expected that the cost of spelter will be relatively high.

Zinc Sheets—The quoted price of zinc sheets is $10 per 100 pounds.

Other Metals

Aluminum—Virgin metal quoted at 33c. per lb. Unchanged.

Antimony—The market was quiet at 8¼@8½c. for spot. Futures were quoted at 8¼@8½c., duty paid, New York, for June-July shipment from the Orient.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.20 per lb. for wholesale lots—500 lb. and over.

Cadmium—Quoted at $1.40 per lb. in lots of 500 pounds.

Nickel—Ingot, 40c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—Supplies in the New York market continue scarce, and the price is strong at $92. San Francisco telegraphs $89, strong.

Silver and Platinum

Silver—Silver has ruled fairly steady the last week, except for a drop in the London market on June 13 to 54d. but the market quickly recovered and closes quiet in London at 54⅛d. There has been a demand outside London bidders for silver from bankers with Far Eastern connections at higher prices and probably to satisfy commercial requirements in payment for exports. Tendency easier at close.

Mexican dollars at New York: June 12, 85⅞; June 13, 85; June 14, 85⅞; June 16, 86⅝; June 17, 87; June 18, 87.

The general stock of money in the United States on June 1, 1919, totaled $7,592,078,992. Of this, $3,092,037,699 was in gold coin and bullion, $308,978,930 in standard silver dollars, and $243,679,762 in subsidiary silver. The money in circulation on June 1 was $5,834,268,212, or $54.29 per capita.

Platinum—Refined ingot is quoted at $105 @107½, and practically the same price is realized for sponge as for ingot. Some manufacturing consumers are as willing to use one form of the metal as the other. During the last week or ten days $105 has even been realized by producers for the platinum content of crude metal. The Government is making plans to liquidate its stock of platinum. This will probably be divided among the distributors in the business for sale over a fairly long period, so as to avoid any disturbance of the market. In view of the diminished production, platinum is manifestly in a very strong statistical position.

Palladium—Strong at $120.

Zinc and Lead Ore Markets

Joplin, Mo., June 14—Blende, per ton, high, $44.20; basis 60% zinc, premium, $42; Prime Western, $42; sludge and flotation, $40@35; calamine, basis 40% zinc, $25@22. Average settling prices; blende, $39.60; calamine, $24.76; all zinc ores, $39.18.

Lead, high, $61.85; basis 80% lead, $58@57; average settling price, all grades of lead, $57.45 per ton.

Shipments the week: Blende, 10,344; calamine, 294; lead, 1226 tons. Value, all ores the week, $487,220.

The Butte-Kansas company closed down its large mill in the Waco area, making five mills in this productive camp now idle. Though the market held firm all week at $42 basis, buyers said today buying was easier, producers selling more readily.

There is a fair-sized reserve stock of zinc ore, but it has been long held in strong hands. Though this stock is in evidence, it is a fact also that several thousand tons have been sold ahead of production.

Platteville, Wis., June 14—Blende, basis 60% zinc, $44.50 base for premium grade, and $42.50 base for high-lead blende. Lead ore, basis 80% lead, $97 per ton. Shipments reported for the week are 2530 tons blende, 80 tons galena, and 564 tons sulphur ore. For the year to date the totals are 46,307 tons blende, 2248 tons lead, and 6370 tons sulphur ore. During the week 2722 tons blende was shipped to separating plants.

Other Ores

Manganese Ore—Metallurgical ore is quoted at 50c. per unit for spot, and 60c. per unit for shipments.

Pyrites—Spanish pyrites is quoted at 20c. per unit for furnace ore, c.i.f., New York or other Atlantic port. Unchanged.

Tariff on Pyrites—Representative Slemp, of Virginia, has introduced a measure (H. R. 5215), which has been referred to the Ways and Means Committee, designed to obtain revenue and to promote and encourage the production of iron sulphide, pyrite, and sulphur, and manufactures thereof, in the United States and its possessions. The measure provides for a duty of 15c. per unit of the sulphur content on pyrites and all crude iron sulphide minerals, ores, and concentrates, when imported from any foreign country into the United States or its possessions.

Tungsten Ore—It appears that the ore offered at around $7 has now been sold, but buyers do not seem to want to bid more than $7.50. Holders of Bolivian ore are not much disposed to sell, even at $10. Cheap offerings of Chinese ore have also disappeared.

Iron Trade Review

PITTSBURGH—June 17

Production of steel ingots in May, by 30 companies which in 1918 made 84.03% of the total output, was 1,929,024 gross tons, indicating that the industry operated during May at the rate of 26,450,000 tons a year, this being 54% of capacity, taking capacity at 49,000,000 tons, and comparing with 65% in April, 77% in March, 85% in February, and 87% in January. With the heavier buying of steel products that began just before the middle of May, there has since been an increase in production. A rate of as low as 50% was probably approximated at some time in May, though the rate now is between 55 and 60%, probably nearer the latter.

Buying of steel has not increased materially in the last week, but sheet demand shows some further improvement, and the sheet industry will probably be running at between 70 and 75% before the end of the month, against between 60 and 65% at the beginning of the month. Merchant pipe shows a little improvement.

Pig Iron—Pittsburgh Steel Foundry has bought a few hundred tons of basic pig iron and Follansbee Bros. Co. about 3000 tons, both for third quarter. Standard Sanitary has bought 4000 tons of foundry iron, half for its works in Pittsburgh and half for its works at New Brighton, June and July delivery, the bulk of the iron being at full Valley prices, though one lot was from a detached furnace at rather a deep cut, the iron being high in manganese, so that only a limited tonnage of the brand could be used. The Valley furnaces are firm, and there is less disposition on the part of outside furnaces to absorb freights to get into the Pittsburgh market, which can be quoted on the Valley basis except for occasional cutting by detached furnaces, including possibly Ironton and Buffalo. Valley prices are: Bessemer, $27.95; basic, $25.75; foundry, $26.75; forge, $25.75, f.o.b. furnace, with $1.40 freight to Pittsburgh.

Steel—The market continues extremely dull in billets, with a fair movement in sheet bars. Prices remain: Billets, $38.50; sheet bars and 2-inch billets, $42; slabs, $41; rods, $52.

Ferromanganese—No sales of English ferromanganese are announced at the new price of $125, delivered east of the Mississippi River for 80%. Domestic resale continues quotable at $110@115, but with offerings now limited. Producers quote nominally $150, delivered, as for months past. Spiegeleisen is $33@35, delivered, for 18% resale.

Coke—Second-half furnace coke has been more or less under negotiation for some time, and sellers who have been in the market right along have now been surprised to find the first three sales made by a new comer, the Oliver & Snyder Steel Co., whose coke has gone exclusively to the Steel Corporation for years, but is now released because the Steel Corporation has so much new byproduct capacity. The three sales totaled 32,000 or 33,000 tons a month, with a ratio of a little more than six tons of coke to one ton of basic iron, Valley furnace, with a minimum slightly under $4 and a maximum that is not particularly high. The company's output will be 50,000 to 70,000 tons a month, and the remainder is now under negotiation. As Eastern furnaces have stated that they will use Eastern byproduct unless they can buy Connellsville at under $4, the outlook for sales by former merchant producers is not as bright as would be indicated by the high prices they are quoting. Second-half foundry coke has been done at $5 to $5.50. Spot furnace coke is a shade easier. We quote spot coke at $3.75@4 for furnace and at $4.50@5 for foundry per net ton at ovens.

MONTHLY AVERAGE PRICES OF METALS

Silver

	New York			London		
	1917	1918	1919	1917	1918	1919
Jan.	75.630	88.702	101.125	36.682	44.356	48.438
Feb.	77.585	85.716	101.125	37.742	42.792	48.027
Mar.	73.861	88.082	101.125	36.410	43.620	48.171
April	73.875	95.346	101.125	36.963	47.215	48.886
May	74.745	99.505	107.135	37.940	48.980	52.104
June	76.971	99.500	.....	39.065	48.875	.....
July	79.010	99.625	.....	40.110	48.813	.....
Aug.	85.407	100.292	.....	43.418	49.077	.....
Sept.	100.740	101.125	.....	50.920	49.500	.....
Oct.	87.332	101.125	.....	44.324	49.500	.....
Nov.	85.891	101.125	.....	43.584	48.969	.....
Dec.	85.960	101.125	.....	43.052	48.492	.....
Year	81.417	96.772	.....	40.851	47.516	.....

New York quotations cents per ounce troy, 999 fine London, pence per ounce, sterling silver, 925 fine.

Copper

	New York		London			
	Electrolytic		Standard		Electrolytic	
	1918	1919	1918	1919	1918	1919
Jan.	23.500	(a)	110.000	92.238	125.000	106.619
Feb.	23.500	16.763	110.000	78.700	125.000	95.700
Mar.	23.500	14.856	110.000	76.821	125.000	82.071
April	23.500	15.246	110.000	77.300	125.000	82.200
May	23.500	15.864	110.000	77.767	125.000	81.227
June	23.500	.....	110.000	.....	125.000	.....
July	25.904	.....	119.913	.....	134.913	.....
Aug.	26.000	.....	122.000	.....	137.000	.....
Sept.	26.000	.....	122.000	.....	137.000	.....
Oct.	26.000	.....	122.000	.....	137.000	.....
Nov.	26.000	.....	122.000	.....	137.000	.....
Dec.	(a)	.....	118.447	.....	133.167	.....
Year	24.628	.....	115.530	.....	130.507	.....

(a) No Market.

Tin

	New York		London	
	1918	1919	1918	1919
January	85.500	67.702	293.227	248.557
February	92.000	66.801	311.525	223.963
March	(a)	67.934	318.875	236.843
April	(a)	72.500	329.905	225.275
May	(a)	72.500	364.217	234.398
June	(a)	.....	331.925	.....
July	(a)	.....	360.347	.....
August	(a)	.....	380.900	.....
September	(a)	.....	343.905	.....
October	(a)	.....	335.543	.....
November	(a)	.....	323.550	.....
December	(a)	.....	267.736	.....
Av. year	(a)	.....	330.138	.....

(a) No average computed.

Lead

	New York		St. Louis		London	
	1918	1919	1918	1919	1918	1919
January	6.782	5.432	6.684	5.316	29.00	37.227
February	6.973	5.057	6.899	4.764	29.00	28.675
March	7.201	5.226	7.091	4.992	29.00	27.952
April	6.772	4.982	6.701	4.722	29.00	24.888
May	6.818	5.018	6.704	4.773	29.00	23.852
June	7.611	.....	7.511	.....	29.00	.....
July	8.033	.....	7.750	.....	29.00	.....
August	8.050	.....	7.750	.....	29.00	.....
September	8.050	.....	7.750	.....	29.00	.....
October	8.050	.....	7.750	.....	29.00	.....
November	8.050	.....	7.750	.....	31.20	.....
December	6.564	.....	6.324	.....	40.00	.....
Year	7.413	.....	7.222	.....	30.10	.....

Zinc

	New York		St. Louis		London	
	1918	1919	1918	1919	1918	1919
January	7.836	7.272	7.661	7.922	54.000	56.045
February	7.814	6.623	7.639	6.273	54.000	46.150
March	7.461	6.500	7.286	6.150	54.000	38.500
April	6.890	6.465	6.715	6.114	54.000	36.118
May	7.314	6.429	7.114	6.079	54.000	35.477
June	8.021	.....	7.791	.....	54.000	.....
July	8.688	.....	8.338	.....	54.000	.....
August	8.985	.....	8.635	.....	54.000	.....
September	9.442	.....	9.092	.....	54.000	.....
October	8.801	.....	8.451	.....	54.000	.....
November	8.491	.....	8.141	.....	54.100	.....
December	8.163	.....	7.813	.....	56.050	.....
Year	8.159	.....	7.890	.....	54.180	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pittsburgh

	Bessemer‡		Basic‡		No. 2 Foundry	
	1918	1919	1918	1919	1918	1919
January	$37.25	$33.60	$33.95	$31.40	$33.95	$32.40
February	37.25	33.60	33.95	31.40	33.95	32.40
March	37.25	32.54	33.95	31.40	33.95	29.12
April	36.15	29.35	32.95	27.15	33.95	28.15
May	36.20	29.35	33.00	27.15	34.00	28.15
June	36.36	.....	33.16	.....	34.16	.....
July	36.60	.....	33.40	.....	34.40	.....
August	36.60	.....	33.40	.....	34.40	.....
September	36.60	.....	33.40	.....	34.40	.....
October	36.60	.....	34.40	.....	35.40	.....
November	36.60	.....	34.40	.....	35.40	.....
December	36.60	.....	34.40	.....	35.40	.....
Year	$36.67	.....	$33.70	.....	$34.45	.....

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. Exch.†	June 17
Alaska Gold M.	3⅛
Alaska Juneau	2⅜
Am.Sm.&Ref.,com.	80⅛
Am.Sm. & Ref., pf.	107
Am.Sm.Sec., pf., A	92
Am. Zinc	22⅛
Am. Zinc, pf.	57
Anaconda	70⅛
Batopilas Min.	1⅛
Bethlehem Steel	85
Butte & Superior	27⅞
Butte Cop. & Zinc	12⅛
Cerro de Pasco	5⅞
Chile Cop.	25⅛
Chino	44⅛
Colo. Fuel & Iron	47
Crucible Steel	90⅛
Crucible Steel, pf.	99⅛
Dome Mines	13⅛
Federal M. & S.	14⅛
Federal M. & S., pf.	41⅛
Great Nor., ore ctf.	46⅛
Greene Cananea	42
Gulf States Steel	58
Homestake	88
Inspiration Con.	58⅛
International Nickel	29⅛
Kennecott	39⅛
Lackawanna Steel	81
Mexican Petrol.	181
Miami Copper	26⅛
Nat'l Lead, com.	77
National Lead, pf.	108
Nev. Consol.	19
Ontario Min.	8
Ray Con.	23⅛
Republic I.&S.,com.	87⅛
Republic I.&S., pf.	102⅛
St. Joseph Lead	13⅛
Sloss-Sheffield	62⅛
Tennessee C. & C.	13
U. S. Steel, com.	106
U. S. Steel, pf.	116⅛
Utah Copper	87⅛
Va. Iron C. & C.	66
Worthington Pump	76⅛

Boston Curb*	June 17
Boston Ely	1⅛
Boston & Mont.	.78
Butte & Lon'n Dev.	.22
Calaveras	1⅛
Chief Con.	3⅛
Contact	‡.05
Cortez	.20
Crown Reserve	.28
Crystal Cop.	.13
Eagle & Blue Bell	2⅛
First Nat. Cop.	1⅛
Gadsden Cop.	3⅛
Houghton Copper	1⅛
Intermountain	‡.05
Iron Blossom	.40
Iron Cap	10⅛
Majestic	.23
Mexican Metals	.16
Mines of America	‡.05
Mojave Tungsten	.13
Nat. Zinc & Lead	.10
Nevada-Douglas	.16
New Baltic	.2
Oneco	.80
Pacific Mines	‡.35
Rex Cons.	.14
Yukon Gold	.75

San Fran.*	June 17
Alta	‡.08
Andes	.20
Best & Belcher	.15
Caledonia	.15
Challenge Con.	‡.03
Confidence	‡.25
Con. Virginia	1.70
Gould & Curry	.06
Hale & Norcross	‡.25
Jacket-Cr. Pt.	.05
Mexican	.43
Occidental	‡.40
Ophir	1.17½
Overman	‡.10
Savage	.15
Sierra Nevada	.10
Union Con.	.29
Utah Con.	‡.04
Belmont	‡3.50
Jim Butler	.34
MacNamara	.70
Midway	.40
Mont.-Tonopah	‡.20
North Star	.10
Rescue Eula	.22
West End Con.	1.62½
Atlanta	.04
Booth	.09
Comb. Frac.	‡.04
Florence	.50
Jumbo Extension	.12
Kewanas	.03
Nevada Hills	.04
Nevada Packard	.23
Round Mountain	.41
Silver Pick	.06
White Caps	.17

Colo. Springs*	June 17
Cresson Con.	4.25
Doctor Jack Pot	.04
Elkton Con.	.04⅛
El Paso	.15
Gold Sovereign	‡.02
Golden Cycle	1.67
Granite	.12
Isabella	.04⅛
Mary McKinney	.07⅛
Portland	.96
United Gold M.	.16⅛
Vindicator	.30

Boston Exch.†	June 17
Adventure	‡1⅛
Ahmeek	‡79½
Algomah	‡.80
Alloues	.40
Ariz. Com.	.14
Arnold	‡.20
Bingham Mines	9⅛
Bonanza	‡.20
Butte-Balaklava	.50
Calumet & Ariz.	.68
Calumet & Hecla	410
Carson Hill	.15
Centennial	.16
Copper Range	49⅛
Daly West	2⅛
Davis-Daly	.7
East Butte	.14
Franklin	4⅛
Granby	‡76⅛
Hancock	.6
Hedley	‡12
Helvetia	5⅛
Indiana	‡1⅛
Isle Royale	.36
Keweenaw	1⅛
Lake	5⅛
La Salle	‡3⅛
Mason Valley	3⅛
Mass	6⅛
Mayflower	10⅛
Michigan	.6
Mohawk	.67
New Arcadian	‡4
New Cornelia	24⅛
New Idria	9⅛
Nipissing	11⅛
North Butte	.13
North Lake	‡1⅛
Ojibway	2⅛
Old Dominion	41⅛
Osceola	.56
Quincy	.77
St. Mary's M. L.	.58
Santa Fe	‡.35
Senseca	23⅛
Shannon	4
Shattuck-Ariz.	‡15⅛
So. Lake	‡3
So. Utah	.25
Superior	‡9
Superior & Bost.	3⅛
Trinity	4⅛
Tuolumne	1
U. S. Smelting	.66
U. S. Smelting, pf.	49⅛
Utah Apex	3
Utah Con.	10⅛
Utah Metal	2⅛
Victoria	3⅛
Winona	‡1⅛
Wolverine	23⅛

N. Y. Curb†	June 17
Alaska Mines	⅜
Big Ledge	⅛
Butte & N. Y.	‡1
Butte Detroit	‡.03
Caledonia	.42
Calumet & Jerome	⅛
Can. Cop. Corpn.	1⅛
Carlisle	‡2
Cashboy	.08
Con. Ariz. Sm.	1⅛
Con. Coppermines	6⅛
El Salvador	4
Goldfield Con.	.18
Goldfield Merger	.04
Hecla Min.	5⅛
Howe Sound	4⅛
Jerome Verde	‡⅛
Louisiana	‡1
Magma	‡37⅛
Marsh	.08
McKinley-Dar-Sa.	.60
Milford	‡.75
Mother Lode	.43
Nixon Nevada	.22
Ohio Cop.	‡.50
Rawley	‡2⅛
Ray Hercules	2⅛
Richmond	‡.50
Rochester Mines	.19
Standard S. L.	⅛
Stewart	.25
Success	.04
Tonopah	3⅛
Tonopah Divide	8
Tonopah Ex.	2⅛
Tribullion	‡.25
Troy Arizona	‡.10
United Eastern	4⅛
United Verde Ext.	‡40⅛
United Zinc	‡.25
Utica Mines	‡.08

Toronto*	June 17
Adanac	.15
Bailey	.03
Beaver Con.	.40
Contagas	2.50
Hargraves	.02
Kerr Lake	5.75
La Rose	.30
Lake Shore	1.00
Min. Corp. of Can.	1.50
Peterson Lake	.08
Teck-Hughes	.18
Temiskaming	.37
Trethewey	.37
Wettlaufer-Lor.	.03
Davidson	‡.68
Dome Exten.	.30
Dome Lake	.18
Hollinger	6.50
McIntyre	1.62½
Newray	.12½
Porcu. Crown	.27
Vipond	.20
West Dome	.12

*Bid prices. † Closing prices. ‡ Last quotations.